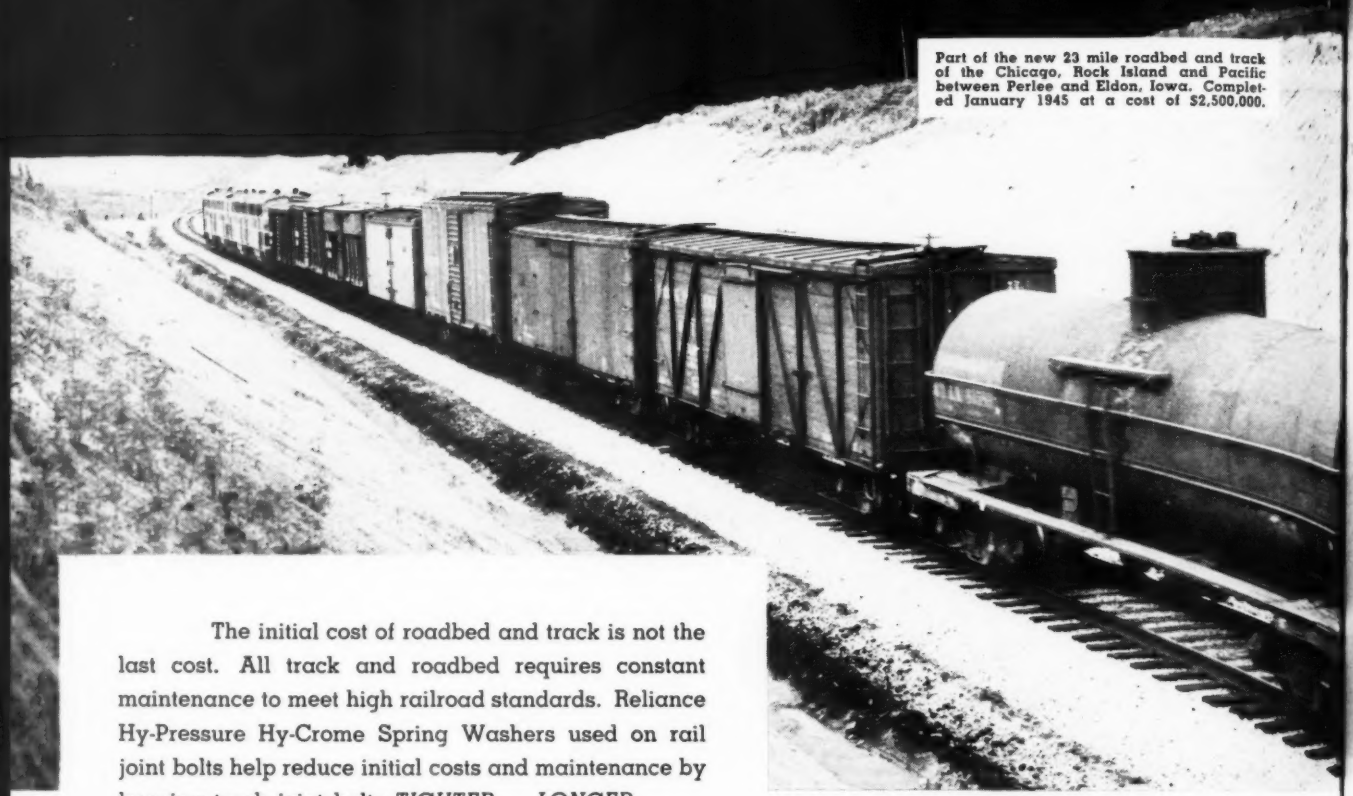
Railway Engineering and Maintenance

108,695 dollars in each mile!



Part of the new 23 mile roadbed and track of the Chicago, Rock Island and Pacific between Perlee and Eldon, Iowa. Completed January 1945 at a cost of $2,500,000.

The initial cost of roadbed and track is not the last cost. All track and roadbed requires constant maintenance to meet high railroad standards. Reliance Hy-Pressure Hy-Crome Spring Washers used on rail joint bolts help reduce initial costs and maintenance by keeping track joint bolts *TIGHTER — LONGER.*

Reliance Hy-Pressure Hy-Crome Spring Washers are carefully fabricated from quality alloy steel. The inherent reactive range possessed by Reliance Hy-Pressure Hy-Crome Spring Washers maintains that all important bolt tension and automatically compensate for inevitable looseness resulting from wear. Reliance Hy-Pressure Hy-Crome Spring Washers exceed AREA specifications. Cut your costs by reducing maintenance.

"Edgemark of Quality"

Write today for six-page illustrated folder on Reliance Hy-Crome Spring Washers for track application. You may want to prove a point when it comes time to choose the right spring washer for your rails.

EATON

EATON MANUFACTURING COMPANY

MASSILLON, OHIO *Reliance Division*

Sales Offices: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal

Let it Snow!

. . . Snow, Rain, Fog, Dew, Brine, and Other Corrosion Accelerators Can't Rust Steel When It's Protected with NO-OX-ID

Railroad maintenance men who protect bridges, tanks, and other steel structures and equipment with NO-OX-ID, the *original* rust preventive, have reason to be complacent about rust-hungry moisture and vapors.

NO-OX-ID prevents rust two ways. The tough, plastic coating mechanically excludes moisture and oxygen from metal surfaces. The chemical inhibitors in NO-OX-ID penetrate to the parent metal to stop underfilm corrosion.

Heartening, too, is the fact that NO-OX-ID can be applied over rusted surfaces without extensive precleaning.

Send for details about NO-OX-ID protection . . . today.

Increase the life span of bridges and stop loss of steel by applying NO-OX-ID to all surfaces.

Prevent corrosion on wayside water tanks by coating them, inside and outside, with NO-OX-ID.

Guard turntables from corrosion caused by constant moisture, live coals, and cinders by applying NO-OX-ID.

NO-OX-ID IRON RUST
REG. TRADEMARK AUG. 27, 1918

The ORIGINAL RUST PREVENTIVE

Dearborn Chemical Company
Dept. U, 310 S. Michigan Ave., Chicago 4, Ill.
New York • Los Angeles • Toronto

Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St. Chicago 3, Ill. Subscription price: United States and Possessions, and Canada, $2.00; Foreign $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933 at the post office at Chicago, Ill., under the act of March 3, 1879, with additional entry at Mount Morris, Ill., post office. Address communications to 105 W. Adams St., Chicago 3, Ill.

50 Ton Load!...Operator is SAFE with Orton

COMPRESSION BRAKING

All Orton Diesel Cranes are equipped with a 3-speed *and reverse* transmission, located just behind the engine to control the speeds of *all* operations of the crane. When lowering a *heavy load*, the transmission is put in reverse and the load is lowered against compression of the engine exactly as you brake your car going down hill in second gear.

Just as in your car, the compression of the engine keeps the load from running away, with no possibility of dropping it. Fine control is secured with the friction brake, *which gives fine control only*, and is not relied upon for the safe holding of the load.

LOAD IS LOWERED AGAINST COMPRESSION OF ENGINE EXACTLY AS YOU BRAKE YOUR CAR GOING DOWN HILL IN SECOND GEAR

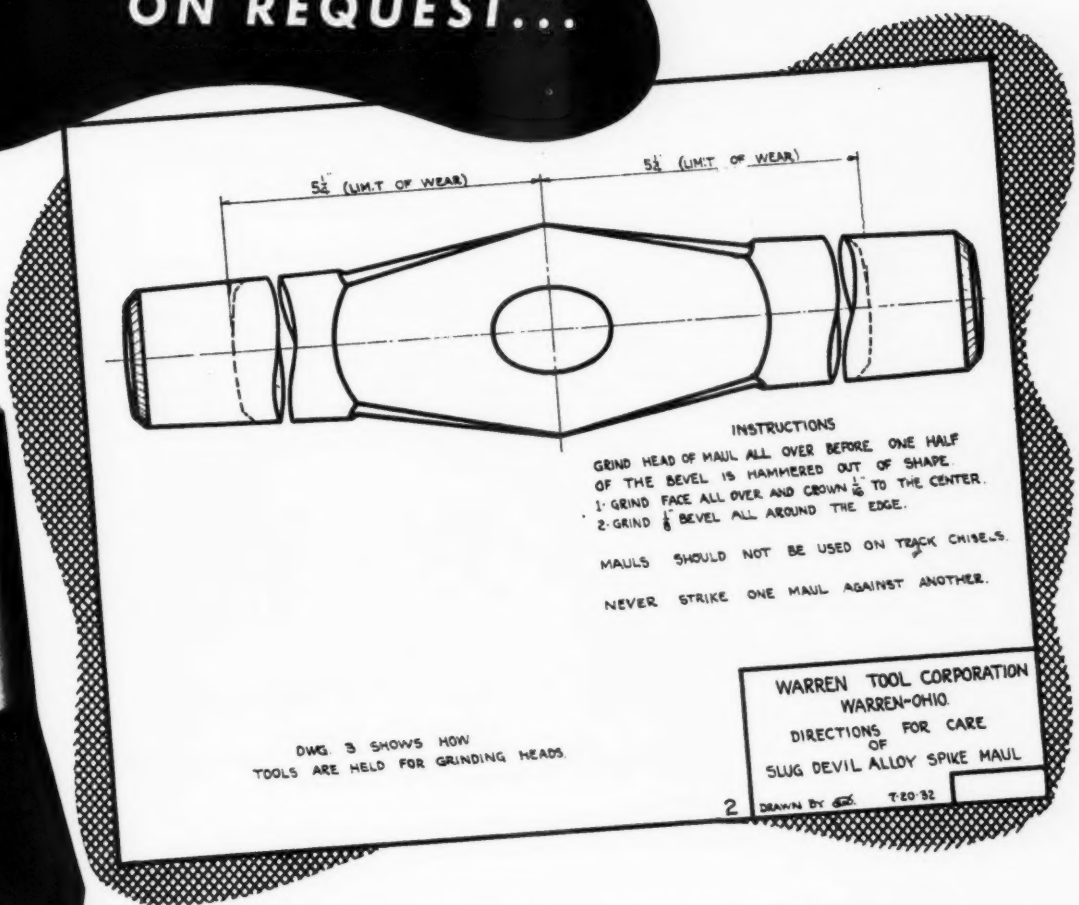
Compression braking is the Orton invention which made the Diesel crane *practical* for handling heavy loads. *Send for Orton Catalog No. 77 giving detailed description.*

NOW A DIESEL CRANE IS *SAFE*

ORTON CRANE & SHOVEL CO.

608 SOUTH DEARBORN STREET • CHICAGO 5, ILLINOIS • OFFICES IN PRINCIPAL CITIES

mailed free
ON REQUEST...


5½" (LIM.T OF WEAR)
5½" (LIM.T OF WEAR)
INSTRUCTIONS
GRIND HEAD OF MAUL ALL OVER BEFORE ONE HALF OF THE BEVEL IS HAMMERED OUT OF SHAPE.
1- GRIND FACE ALL OVER AND CROWN 1/16" TO THE CENTER.
2- GRIND 1/8" BEVEL ALL AROUND THE EDGE.
MAULS SHOULD NOT BE USED ON TRACK CHISELS.
NEVER STRIKE ONE MAUL AGAINST ANOTHER.
DWG. 3 SHOWS HOW TOOLS ARE HELD FOR GRINDING HEADS.
WARREN TOOL CORPORATION
WARREN-OHIO.
DIRECTIONS FOR CARE OF SLUG DEVIL ALLOY SPIKE MAUL
2
DRAWN BY
7-20-32

NO. 101-X

Warren Tool Corporation maintains its interest in Devil Tools long after the actual sale and delivery are made. IN LINE WITH THIS POLICY, THE COMPANY OFFERS YOU FREE VAN DYKE PRINTS FOR THE PROPER CARE OF TOOLS. You can make from these prints as many copies as you wish. By putting copies on the walls where they will be seen and used, you will stimulate better tool care, promote safety, and reduce costs. Remember, too, that the Devil Line of spike mauls is hardened deeply enough to safe regrind limits. Use the coupon for quick answer to your request for Van Dyke prints.

WARREN TOOL CORP., WARREN, OHIO

Please send Van Dyke Prints for the Proper Care of Tools.

Name of Road_____

Your Name_____

Title_____

Address_____

City_____ State_____

WARREN TOOL CORP.

Plant: WARREN, OHIO

General Sales Offices:

105 W. ADAMS ST. • CHICAGO, ILL.

Red Lead

NEUTRALIZES ACIDS *that Speed Up Rusting*

Every maintenance engineer knows that Red Lead has long been the outstanding protective paint for metal.

But did you know that one of the important reasons is the ability of Red Lead to counteract the acid conditions which are recognized as accelerators of rust?

Structural steel is usually exposed to acid environments. This is so because acid-forming compounds are produced by certain gasses and smoke in contact with moisture. Pollution of waterways also results in acidity.

Moreover linseed oil, synthetic resin varnishes and other commonly used paint vehicles *themselves* produce organic acids in the normal process of aging. Many of these also accelerate corrosion.

When Red Lead is the pigment in a protective paint, rust-causing acidity is kept under control. Actually, a "controlled" acid level is maintained in the paint film. This is a singular property of Red Lead and also contributes to the utmost in film flexibility impermeability and long life.

* * *

The value of Red Lead as a rust preventive is most fully realized in a paint where it is the only pigment used. However, its rust-resistant properties are so pronounced that it also improves any multiple pigment paint. No matter what price you pay, you'll get a better paint for surface protection of metal if it contains Red Lead.

* * *

Write for New Booklet—"*Red Lead in Corrosion Resistant Paints*" is an up-to-date, authoritative guide for those responsible for specifying and formulating paint for structural iron and steel. It describes in detail the scientific reasons why Red Lead gives superior protection. It also includes typical specification formulas. If you haven't received your copy, address nearest branch listed below.

* * *

The benefit of our extensive experience with metal protective paints for both underwater and atmospheric use is available through our technical staff.

NATIONAL LEAD COMPANY: New York 6; Buffalo 3; Chicago 80; Cincinnati 3; Cleveland 13; St. Louis 1; San Francisco 10; Boston 6, (National Lead Co. of Mass.); Philadelphia 7, (John T. Lewis & Bros. Co.); Pittsburgh 30, (National Lead Co. of Pa.); Charleston 25, W. Va. (Evans Lead Division).

Dutch Boy
Red Lead

Here's what your money buy in a NORTHWEST

INDEPENDENT CROWD plus AUTOMATIC CROWD
FOR GREATER DIGGING POWER
The DUAL CROWD

- **Simplicity of design**
  —for easy upkeep in remote a
- **The Northwest Dual Indepen Crowd**
  —utilizes force other shovels w
- **Cast Steel Bases with Cast Machinery Side Frames**
  —plenty of strength—keep sha alignment.
- **"Feather-Touch" Clutch Co**
  —easy operation without fear o down because of control failur
- **Cushion Clutch**
  —reduces overloads on parts u power in heavy digging.
- **Helical Gear Drive**
  —there is no finer power take
- **Uniform Pressure Swing Clut**
  —trouble-free — fewer adjustn —smooth operation.
- **Ball or Roller Bearings o high speed shafts**
  —minimum loss of power to fric
- **Positive Traction while tur as well as when going stra ahead**
  —Northwests go where other chines have difficulty.
- **Crawler Gears fully enclose**
  —full protection against rough g
- **Easy convertibility to Cran Dragline**
  Makes possible quick conver from shovel to crane or draglin bank trimming, run-off ditches other drainage work, pile dri handling pipe or culvert, hand coal and ballast and doing al other odd jobs that this type o chine can do either out on the or in the store yard.

Here is a combination of feat you won't find on any other m of machine—it's a real Rock Sh —a highly versatile unit—a rail rig that will answer many of y maintenance problems at lower c Are you planning your equipn needs far enough ahead? Ask al Northwest in connection with th There is a size for every probl

PROVED on the nation's LEADING RAILROADS

NORTHWEST ENGINEERING COMPANY
1713 Steger Bldg. • 28 E. Jackson Blvd. • Chicago 4, Ill.

NORTHWEST

32 MILLION

HEADFREE JOINTS Purchased by Railroads in the United States and Canada Since Their Introduction...

More Than Enough Bars Laid End to End to Circle the World at the Equator

The UNIT RAIL ANCHOR

» one piece

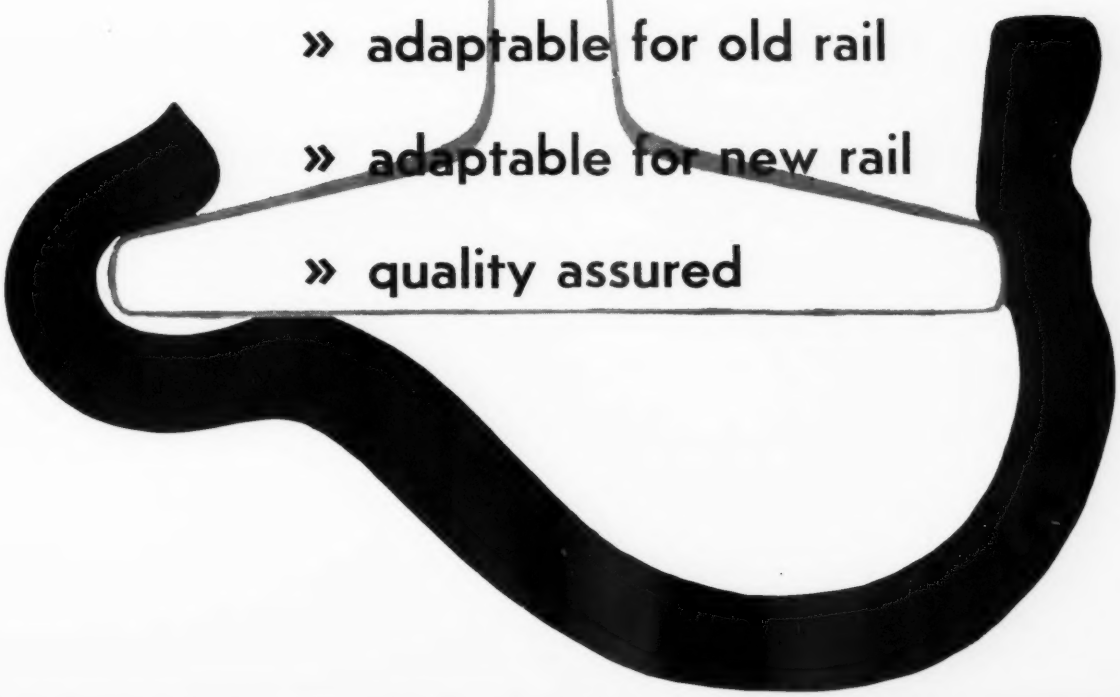
» easy to apply

» easy to reapply

» adaptable for old rail

» adaptable for new rail

» quality assured



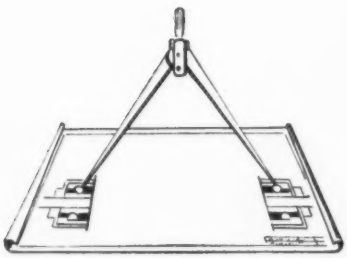
New York Office
3712 Woolworth Bldg.
233 Broadway
New York (7), N. Y.

UNIT RAIL ANCHOR COMPANY, INC.
Subsidiary of Hubbard & Co. — Tool Division
Manufacturers of Quality Railroad Track Tools and Alloy Spring Washers per AREA Specifications
6301 Butler Street
Pittsburgh (1), Pennsylvania

Chicago Office
Room 924
332 S. Michigan Ave.
Chicago (4), Ill.

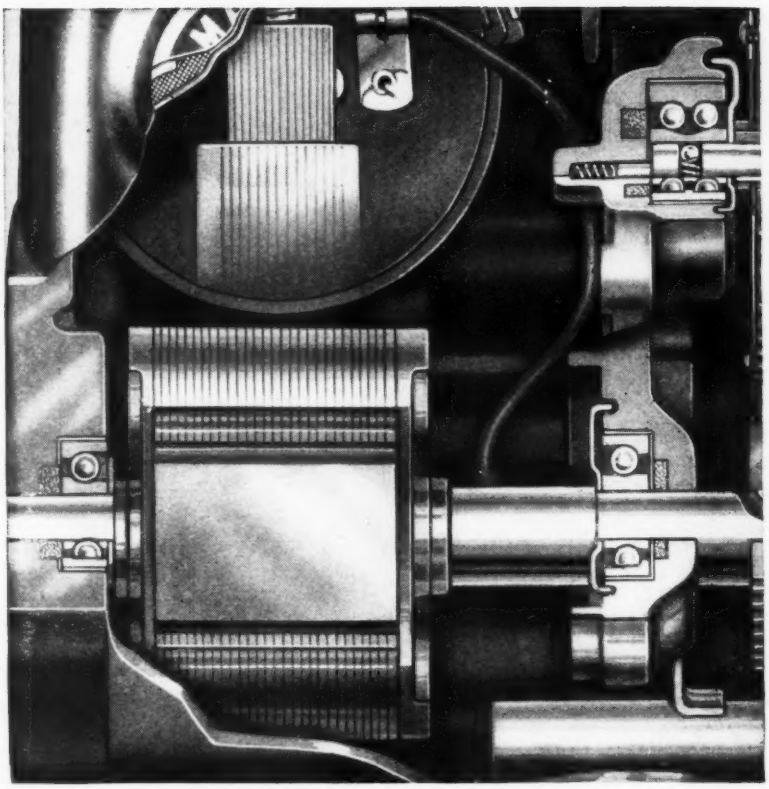
GOOD MAGNETOS

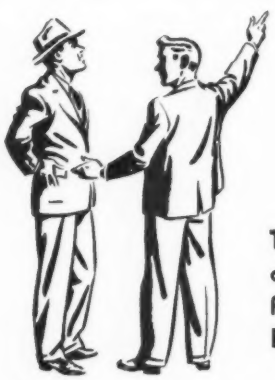
have Correctly-spaced Bearings

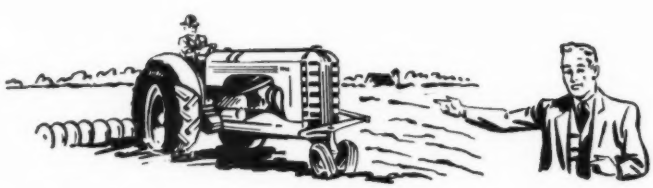


CORRECT SPACING IS VITAL. It is vital that spacing between rotor and rotor tunnel be maintained to hair-line accuracy. This can be done only by correctly-spaced bearings, maintaining proper alignment of the rotor under all operating conditions.

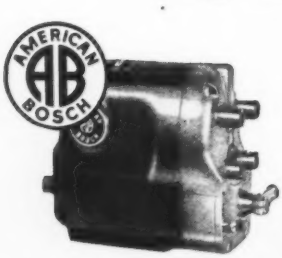
AMERICAN BOSCH MAGNETOS have correctly-spaced bearings for longer life and smoother, more-dependable performance.







THEY CAN TAKE IT. They stand up under the most gruelling conditions because they are balanced for smooth, vibration-free performance. You'll find many such hidden values behind the American Bosch trademark on all types of automotive electrical equipment.



AMERICAN BOSCH CORPORATION, SPRINGFIELD 7, MASS.

AMERICAN BOSCH

Super-Powered Magnetos

NEW SAFETY AHEAD

with "Caterpillar" Diesels on the job

Far-sighted railroad men keep up a ceaseless vigil for greater safety along their right-of-ways. They pay particular attention to daylighting cuts and bolstering traffic-heavy shoulders and fills.

The men of the Denver & Rio Grande Western Railroad are proud of their "Caterpillar" Diesels. One, a D-7, is shown here working at an altitude of 6000 feet near Spanish Fork, Utah. On the go 10 hours a day, this model, equipped with a 10¼-foot "Caterpillar" 7A Bulldozer, has demonstrated an amazing capacity for work. Its low operating cost is borne out by its 2½-gallon-an-hour fuel consumption. Its reputation for dependability and versatility makes it a big favorite on maintenance jobs of all types. And prompt, efficient service is always available through "Caterpillar" dealers.

CATERPILLAR TRACTOR CO., PEORIA, ILL.

CATERPILLAR Diesel

REG. U.S. PAT. OFF.

ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

The discharged veteran wears this emblem. Remember his service and honor him.

1. On New York Central System tracks near Stevensville, Ontario, two pressure tanks were used to speed up the work.

2. No slow orders here as a fast New York Central freight train interrupts pressure grouting only momentarily near Oak Harbor, Ohio.

3. The foreman can tell from the pulsations of the injection line when grout is being taken.

PRESSURE GROUTING

returns own Cost and More in Reduced Track Maintenance

A decade of use in curing soft spots in subgrades has established pressure grouting with portland cement as both an engineering and an economic success.

AN ECONOMIC SUCCESS

One major railroad is saving $2,157 per month as a result of grouting 11,882 ft. of track—a saving which continues month after month, year after year. We will be glad to tell you of many projects on different railroads where the entire cost of grouting was returned by savings in maintenance within a few months.

AN ENGINEERING SUCCESS

Pressure grouting is a simple, positive method of eliminating water pockets or soft spots and increasing the load-bearing strength of subgrades. It is a standard maintenance operation on more than twenty railroad systems.

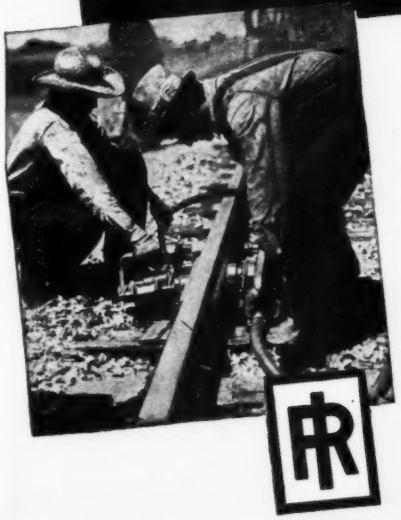
Engineering procedure and required equipment described in illustrated folder, "*Stabilizing Railroad Track by Pressure Grouting.*" Free in United States and Canada.

PORTLAND CEMENT ASSOCIATION

Dept. 3-27, 33 West Grand Ave., Chicago 10, Ill.

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

Visioneering THE ART OF LOOKING AHEAD IN ORDER TO PLAN FOR THE FUTURE



Engineering and Maintenance did a remarkable job of keeping war-time traffic on the move. For three consecutive years the maintenance forces were hard pressed for labor. The solution was—more power tools—they helped to maintain track—safe track—that carried the extra-heavy traffic that helped in the hard-won victory.

Railroad "Visioneering" includes the use of the many I-R Track tools which lessen operator fatigue—offset rising costs—increase productiveness of labor and equipment. These tools include lightweight tie tampers, speedy spike drivers, powerful wrenches, wood borers, rail drills, grinders, etc.—a complete line of *air* tools which assure savings in every operation—and a complete line of I-R compressors to furnish the air power.

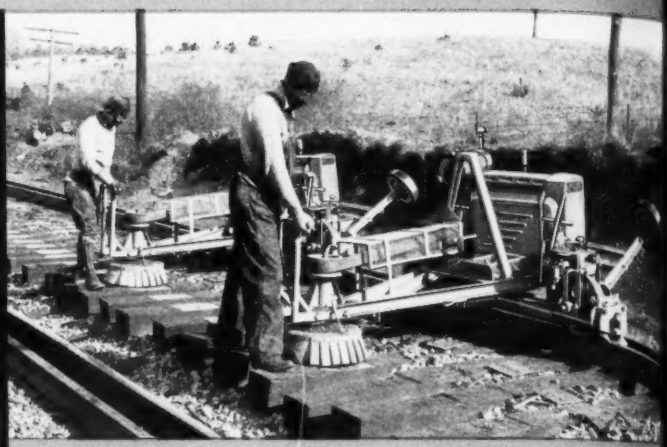
Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

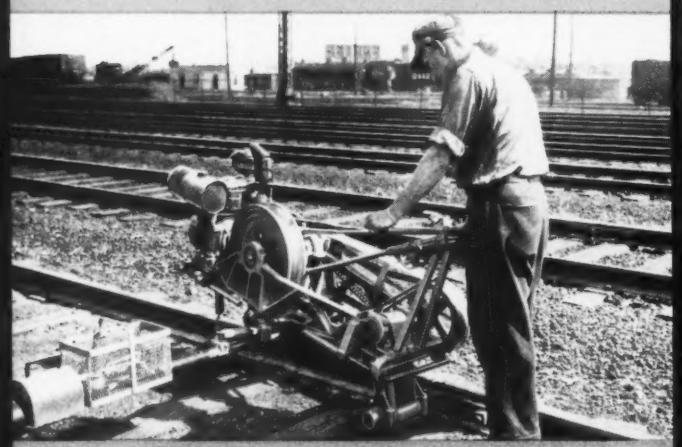
11-740

Mechanize your Track Maintenance

Spike Puller — Three men and the Nordberg Spike Puller can easily pull 30 to 45 spikes per minute.

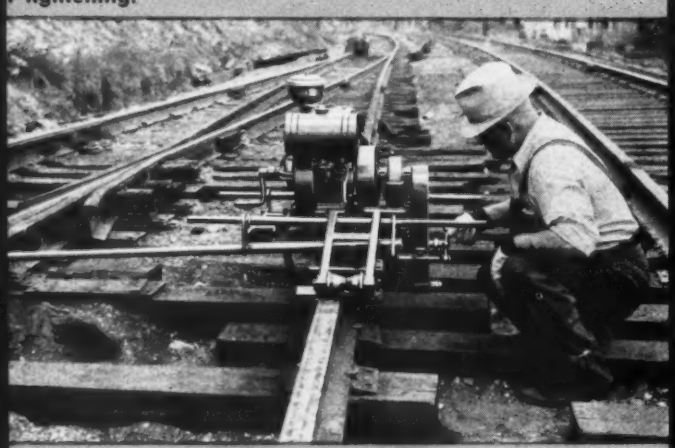


Adzing Machine — Every Class 1 road uses Nordberg Adzing Machines for preparing tie seats when laying new rail.

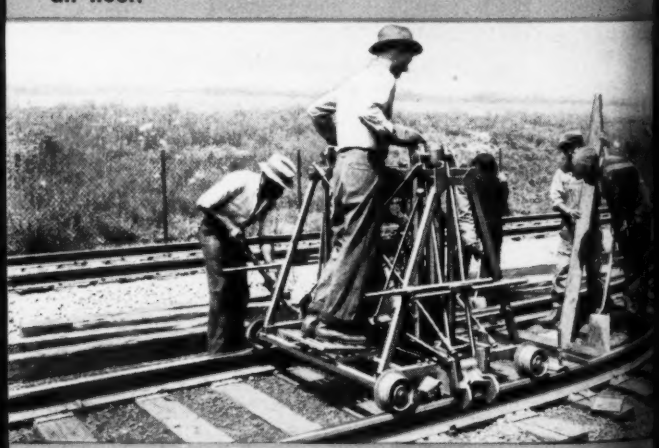


Power Wrench — In addition to its speed, the Nordberg Power Wrench has the advantage of uniformity of tightening.

Spike Hammer — The newest tool in the Nordberg line is the Spike Hammer which will drive 800 spikes an hour.



Rail Drill — The Nordberg Rail Drill is a fast drilling machine, easily set up and operated by one man.



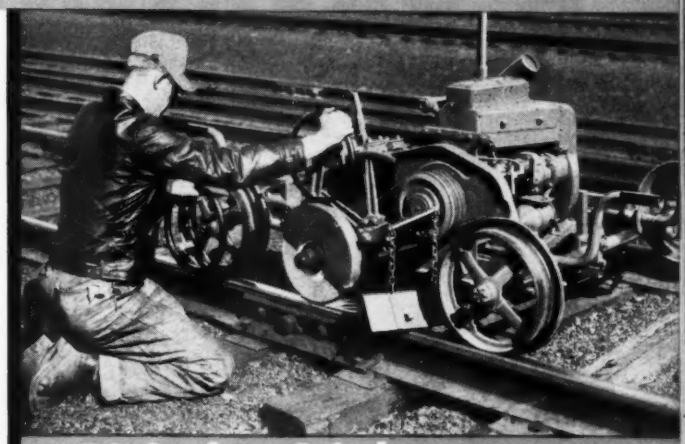
Power Jack — This hydraulic Nordberg Power Jack is fast, accurate in lift and is a big labor saver.

The NORDBERG LINE

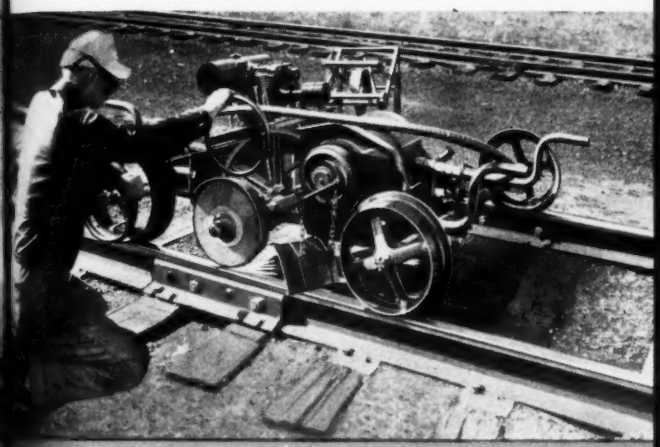
...ce with NORDBERG POWER TOOL

• This line of power driven tools represents more than twenty years of Nordberg's contribution to better maintenance of railway track attained at big savings in time and labor. Incorporated in these tools are the ideas of many outstanding maintenance men who appreciate the advantages of mechanized track gangs in these days of shortage of track labor. If you are not using these machines now, write for further particulars how they will help you in your work.

NORDBERG MFG. CO.
MILWAUKEE 7, WIS.

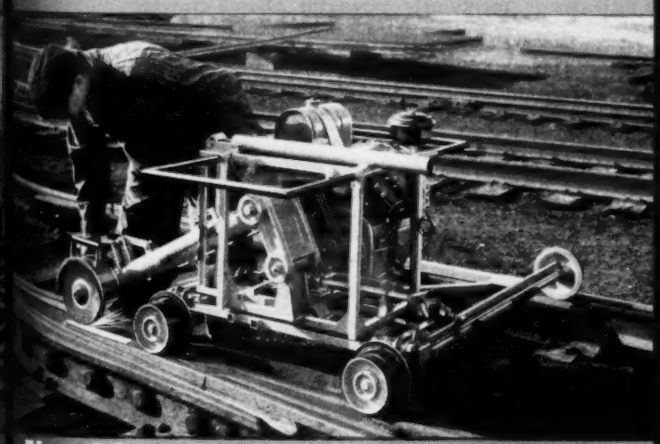


BG Surface Grinder — The BG Grinder is a heavy duty machine especially designed for grindin welded rail ends.



DG Surface Grinder — The DG Grinder is a lightweight surface grinder for use in congested traffic areas.

Utility Grinder — This general purpose flexibl shaft UG Grinder is adaptable to many grinding jobs i maintaining rail and switches.

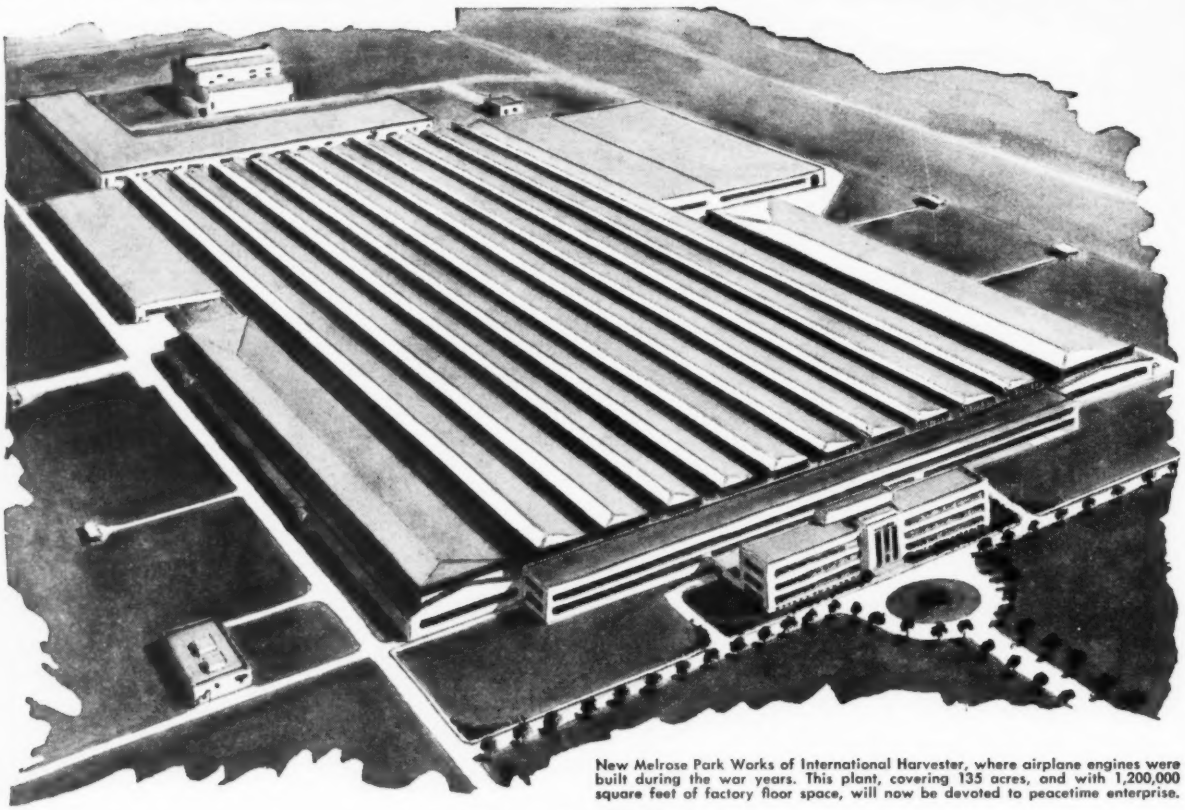


Flexible Arm Grinder — This Flexible Arm Grinder will reach and do grinding at any part of the track structure.

Midget Grinder — The Midget Grinder is a pre cision machine especially adapted for surface grinding i dense traffic areas.

RAIL LAYING • RECONDITIONING RAIL, SWITCHES AND CROSSINGS

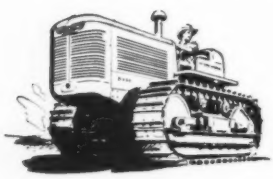
A GREAT NEW PLANT

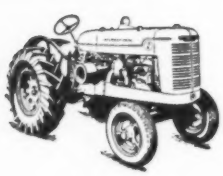


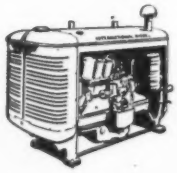
New Melrose Park Works of International Harvester, where airplane engines were built during the war years. This plant, covering 135 acres, and with 1,200,000 square feet of factory floor space, will now be devoted to peacetime enterprise.

For Building

IH INTERNATIONAL POWER







• International Harvester has added the giant Melrose Park Works, on the outskirts of Chicago, to the facilities of the Industrial Power Division. Purchase of this plant makes it possible to save many months in getting the expanded lines of International Crawlers, Industrial Wheel Tractors, and Diesel Engines into production. It will also help provide unsurpassed capacity for research and manufacture of International Industrial Power—power that's designed for your needs. Melrose Park Works, plus Tractor Works, Chicago, and Milwaukee Works, will now be at your service, producing power for postwar industry and construction.

Great things are coming in International Power. A new and tremendously powerful Diesel crawler tractor, the huge TD-24, is just one of the new developments that will be offered to industrial power users. New and improved Diesel power units are to be added to the present International line.

As in the past, you can look with confidence to International for the most advanced engineering in industrial power equipment.

Keep in touch with your International Industrial Power distributor. He will have the latest and most complete information for you.

Industrial Power Division

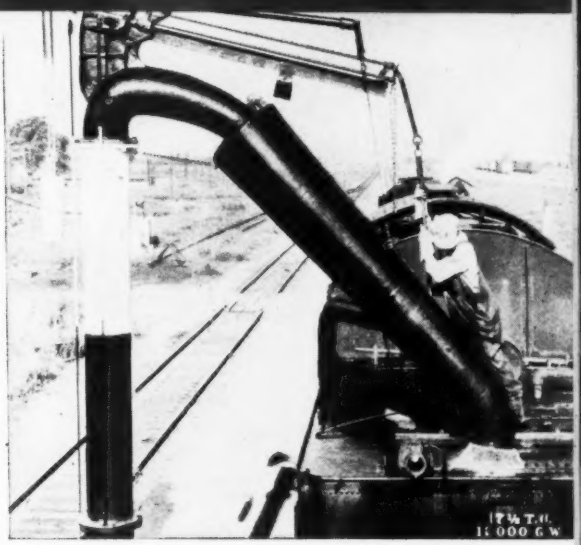
INTERNATIONAL HARVESTER COMPANY

180 North Michigan Avenue — Chicago 1, Illinois

INTERNATIONAL Industrial Power

DOWELL

when minutes mean dollars!



water lines cleaned the chemical way handle more water—faster!

Men responsible for maintaining railroad schedules ar well aware that an adequate supply of water is essentia They know that a few minutes saved at each waterin station means many dollars saved.

The Dowell method of chemically dissolving accumulate scale is the modern, rapid method of cleaning importan water lines . . . under ground, above ground—indoors c out! Leading railroads, utilities and other industries hav found it practical, reliable and economical.

Dowell specialists offer a complete chemical cleanin service. They analyze samples of deposits taken from *you* lines, prepare the proper solvents—and furnish all nece sary equipment to control completely every step of th thorough cleaning operation.

Call the nearest Dowell office for a free estimate. Ask for your copy of "More Power to America's Industry"—new color booklet which describes the Dowell Industrial Chemical Service in detail.

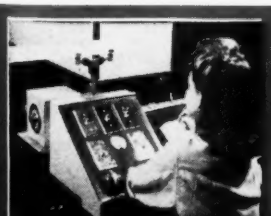
DOWELL INCORPORATED, TULSA 3, OKLAHOM

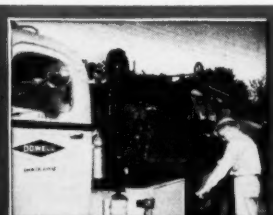
Subsidiary of The Dow Chemical Company

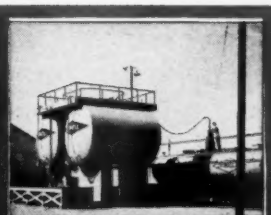
New York • Philadelphia • Baltimore • Buffalo • Cincinnati • Clevelan Chicago • Detroit • St. Louis • Houston • Kansas City • Wichita Mt. Pleasant, Michigan • Salem, Illinois

Long Beach, Cal., Casper, Wyo.: Dowell Affiliate—International Cementers, In

SPECIALISTS IN CHEMICAL CLEANING SERVICE







DOWELL

Dowell's experienced indus- trial engineers are backed by the complete research

Dowell's equipment is exten- sive and complete—scientifi- cally designed. Treating

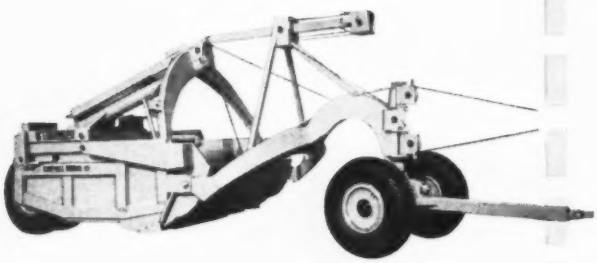
Dowell cleaning services are "tailor-made" to fit each job. All ingredients are of

FOR INDUSTRIAL CHEMICAL SERVICE

LeTOURNEAU OFF-TRACK EQUIPMENT FOR RAILROAD CONSTRUCTION AND MAINTENANCE

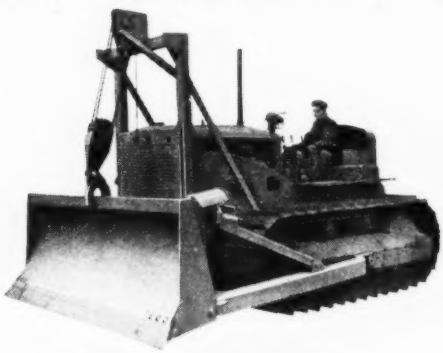
TOURNAPULLS

To move more dirt faster and at lower cost, use today's modern Tournapull. Rolling on giant rubber tires, this self-powered Scraper excavates, hauls and spreads its own loads; travels 2 to 3 times faster than conventional crawling tractors. Over 4,000 are now in use on grading, drainage, coal handling, and surfacing jobs just like those on your construction and maintenance program. Super "C", illustrated, capacity 15 heaped yards.



CARRYALL SCRAPERS

Ruggedly built to excavate, haul and spread all types of materials, LeTourneau Carryall Scrapers are made in sizes from 4 to 23 heaped yards capacities. Will work with any make of old or new crawling tractor fitted with double-drum power control unit. Welded steel construction gives maximum strength with minimum weight. Big tires give more flotation for easier rolling. Job-proved over 24,800 built and shipped.



TILTDOZERS

The LeTourneau Tiltdozer is an improved tool for all types of heavy clearing and pioneering work. Its strong, narrow blade is light in weight and mounts close to the tractor nose. Simple, low maintenance cable control. Extremely high lift, low blade drop. In addition, blade can be easily tilted, up to 12", at either end for quick penetration and cutting in on side-hill work. Built for "Caterpillar" D4, D6, D7 tractors.

You have here a modern line of high-speed, off-track, rubber-tired, earthmoving construction and haulage equipment — plus a full choice of tools for work with crawling tractors.

Thus, you can standardize on LeTourneau equipment for lowest costs on your earthmoving for construction and maintenance as well as your off-track haulage and lifting problems. Every tool is backed by the job experience of over 150,000 LeTourneau units built and shipped.

Your LeTourneau railroad distributor will be glad to show you just what this LeTourneau job-proved equipment can do for you. May we have him call on you?

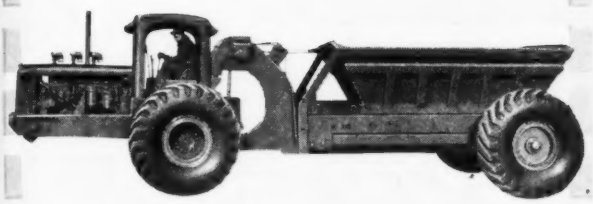
Industrial Sales Division

R. G. LeTOURNEAU INC

PEORIA, ILL., U. S. A.

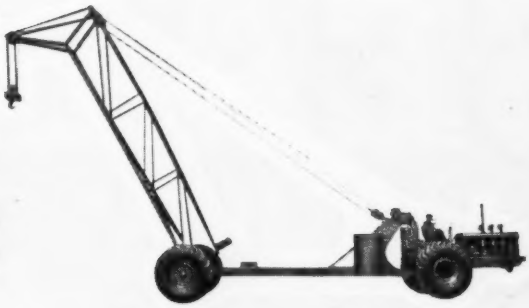
Manufacturers of TOURNAPULLS*, ANGLEDOZERS*, BULLDOZERS, TILTDOZERS*, CARRYALL* SCRAPERS, POWER CONTROL UNITS, ROOTERS*, TOURNATRAILERS*, TOURNACRANES*, TOURNATRUCKS*, SHEEP'S FOOT ROLLERS, TOURNAROPE*, TOURNAWELD*, TOURNALIFTS*.

* Trade Mark Reg. U.S. Pat. Off.



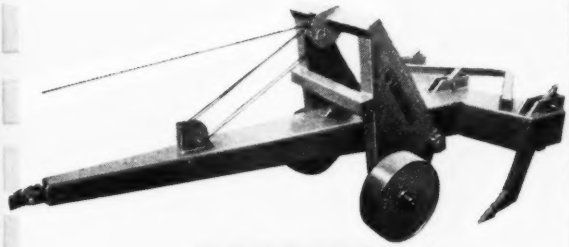
TOURNATRAILERS

This high-speed hauling unit — the Tournatrailer — is built for shovel, dragline or clamshell loading — to haul ballast, sub-base gravel, rock, coal, cinders, etc. Super "C" unit carries 17 heaped yards. Has big top for fast loading; big tires for off-track haul; positive control rear dump. Uses same interchangeable prime mover that powers Tournapull, Tournacrane and Tournatruck, a flat-bed hauling unit.



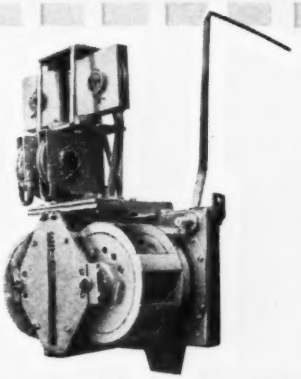
TOURNACRANES

Another versatile Tournapull-drawn unit, the Tournacrane, loads and unloads railroad cars, places rail and switches, erects structural steel, lifts and places heavy machinery, culverts, transmisson line poles, handles heavy lifts in yards or shop, etc. Lifts and carries loads up to 50,000 lbs., depending on Tournacrane model. Big tires travel across track, yards, work anywhere on right-of-way without tying up rail traffic.



ROOTERS

Here is a safe, low-cost way to shatter shale, rocky or frozen ground without blasting. By using a LeTourneau Rooter you can break up any hard material, except solid rock, for easier, faster excavation. Will work with any crawling tractor fitted with a cable power control unit. Rugged, strong . . . built in 2 sizes. Shown is extra-heavy-duty model for the toughest jobs. Will take full pull of two 113 h.p. tractors.



POWER CONTROL UNITS

Fast, powerful in all temperature extremes, LeTourneau Power Control Units provide standard cable control for the complete line of LeTourneau equipment. Designed for: Allis-Chalmers L, L-O, HD10, HD14, S, SO; International TD40, TD18, TD14, Cletrac FD, FG, DD, DG, CG; and all "Caterpillar" crawler tractors, except D2. Simple and reliable cone-clutch units, furnish easy and accurate control.

EXI7RR

FOR COMPLETE SPECIFICATIONS & MORE INFORMATION ON THE LETOURNEAU LINE SEND FOR NEW CATALOG

Industrial Sales Division, R. G. LeTOURNEAU, INC., Peoria, Ill., U.S.A.

NAME..... TITLE.....

COMPANY.....

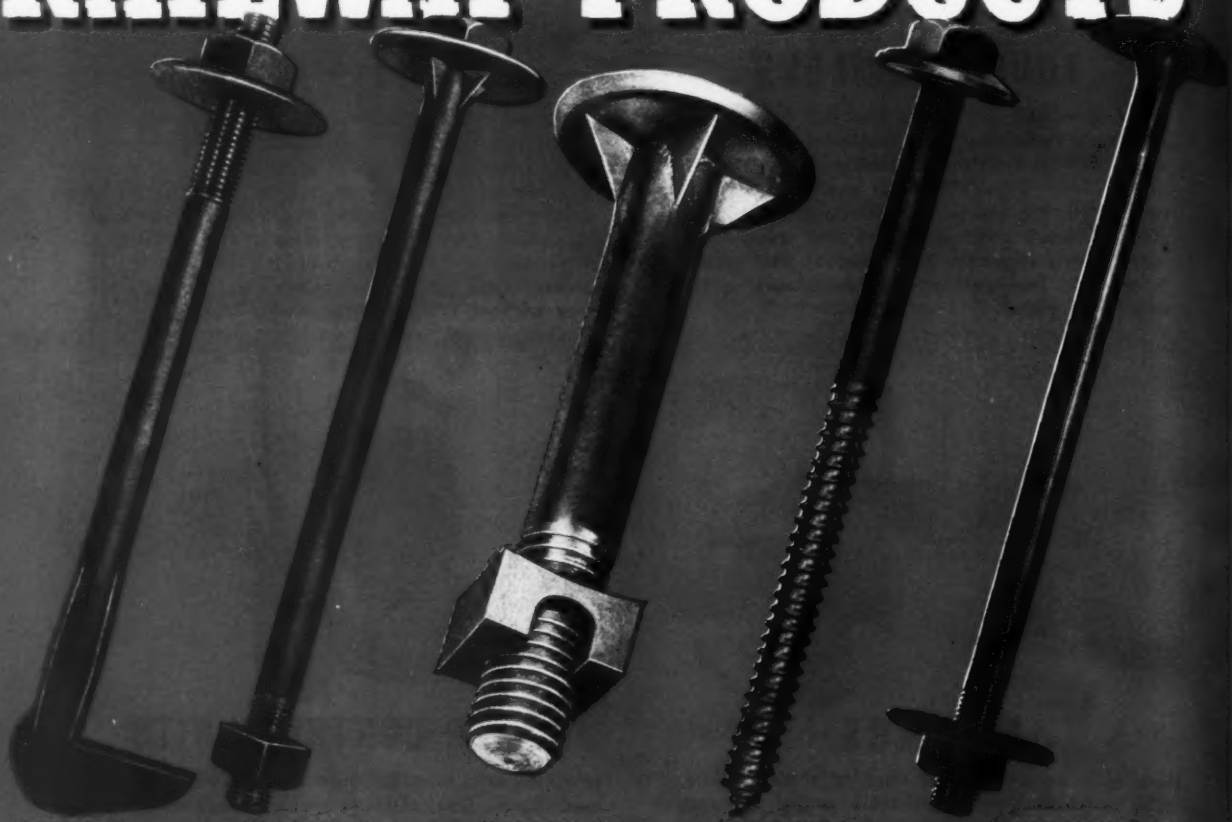
DEPARTMENT.....

STREET ADDRESS.....

CITY..... STATE.....

R.E.M.

SEALTITE
RAILWAY PRODUCTS

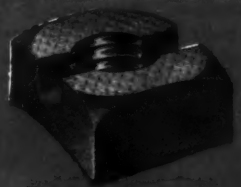


SEALTITE HOOK BOLT | SEALTITE TIMBER BOLT | SEALTITE CAR BOLT | SEALTITE LAG SCREW | SEALTITE GUARD RAIL BOLT

SEALTITE WASHER NUT

***Double-Life* FINISH—Sealed in Zinc**

Actual service tests reveal thicker economies are effected by specifying Sealtite Railway Products with Double-Life Hot-Dipped, sealed in zinc finish. Corrosion is retarded—the fasteners have much longer life and expensive replacements are eliminated. Protect your investment—*specify* Hot-Dipped Galvanized—Sealed in zinc.



LOKTITE NUT

LEWIS BOLT & NUT COMPANY, 504 Malcolm Ave. S.E., Minneapolis, Minn.

Serving 72% OF AMERICA'S CLASS I RAILWAYS

A packaged pumping station

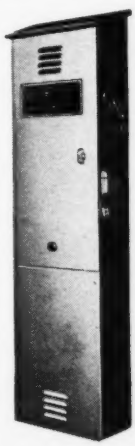
B.J SUBMERSIBLE

LOWERS THE BOOM ON WATER PUMPING PROBLEMS

The Submersible differs from all other types of deepwell turbine pumps. It is a major advancement in the design of such equipment. And it is manufactured exclusively by Byron Jackson.

PUMP AND MOTOR A SINGLE UNIT

The Submersible is delivered, ready for installation, as a compact, "packaged" pumping station: Submersible motor-pump unit, marine cable, weatherproof starting panel. The short-coupled Submersible consists of direct-connected motor and deepwell turbine pump. The motor-pump operates *entirely submerged in water.* It is connected to the column pipe and lowered to *any* well-depth. A surface plate attached to the top end of the column pipe rests on a foundation and suspends the column and the motor-pump unit. Only a discharge pipe and starting panel are at the top of the well. But nothing need show at the surface. Submersibles have even been paved over. The control switch can be located at a remote point, if desired.



Compact, weatherproof starting panel replaces the pump house.

SUBMERSIBLE ADVANTAGES

Shaft-type Installations Cannot Equal These

NO PUMP HOUSE—Motor-pump unit submerged. Only a weatherproof starting panel at surface.

NO ADJUSTMENTS—Precision factory assembly eliminates field adjustments during or after installation.

NO LUBRICATION—Motor-pump unit is sealed in oil.

YEARS OF AUTOMATIC, TROUBLE-FREE OPERATION

NO WELL TOO DEEP—Units perform equally well submerged a few feet or hundreds of feet.

CROOKED WELLS—Submersibles can be installed in wells too crooked for shaft-type pumps, because no drive shaft extends to the surface.

NO WATER CONTAMINATION—Motor oil sealed in motor case.

QUIET OPERATION—No motor or moving parts at surface.

UNAFFECTED BY ATMOSPHERIC CONDITIONS OR FLOODS

SAFE AGAINST VANDALISM

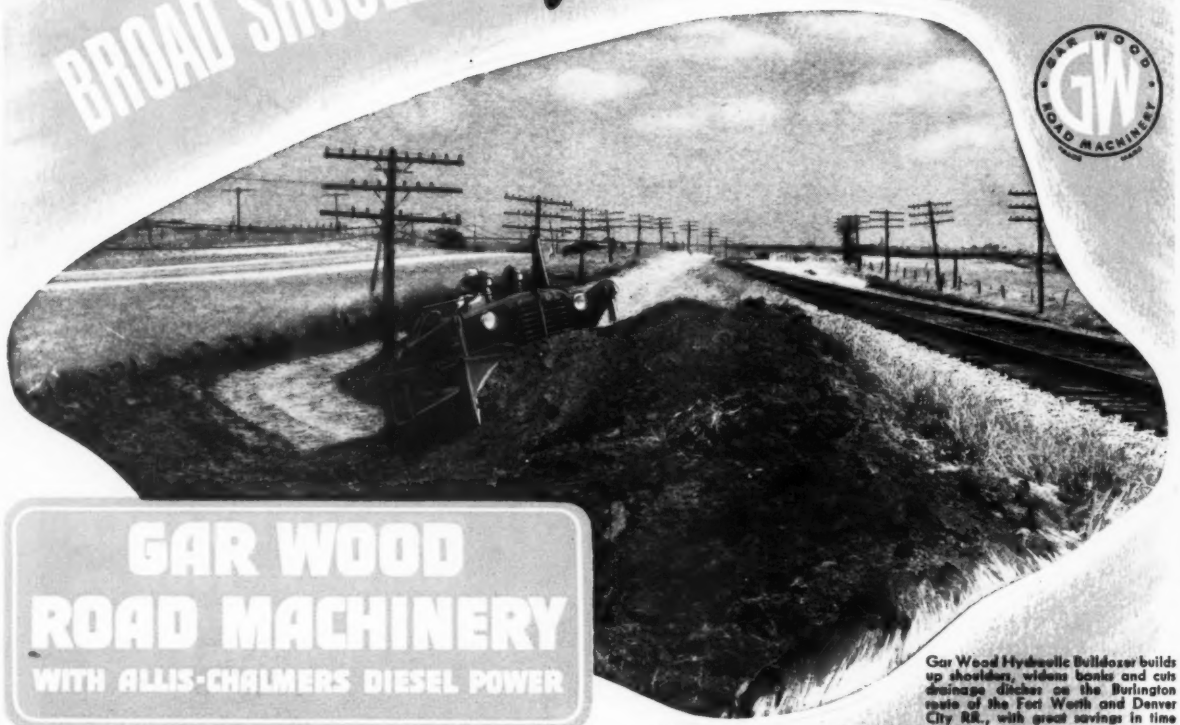
ENGINEERING DATA

Motor Sizes: 5 to 350 hp
Capacities: 50 to 10,000 gpm

Byron Jackson Co.

HOUSTON • LOS ANGELES • NEW YORK

BROAD SHOULDERS *for the big job ahead*



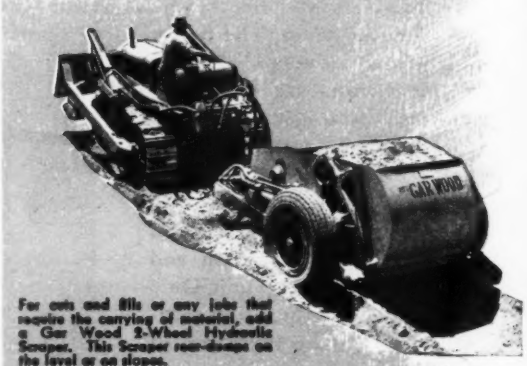
GAR WOOD ROAD MACHINERY
WITH ALLIS-CHALMERS DIESEL POWER

Gar Wood Hydraulic Bulldozer builds up shoulders, widens banks and cuts drainage ditches on the Burlington route of the Fort Worth and Denver City RR., with great savings in time and costs.

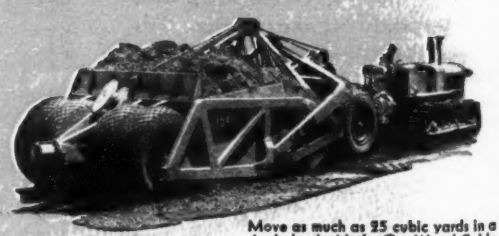
The broad shoulders of Roadmasters and Maintenance-of-Way Men have borne the responsibility of keeping trains rolling during the last five years with courage and efficiency acclaimed by the nation. Now, on these same shoulders, is being placed another huge task—the restoration and improvement of track beds which have undergone the most severe pounding in history.

New high standards of efficiency and workmanship have already been established in this program by the increasing use of modern off-the-track equipment such as Gar Wood Bulldozers, Dozecasters and Scrapers. These versatile units handle any type of grading at any location and at any time without interference to or from traffic. They quickly build up shoulders and slopes, clean ditches or make major cuts and fills and get each job done faster, at less cost.

Gar Wood Road Machinery is railway-proved and approved. Place your orders now with your nearby Allis-Chalmers dealer.



For cuts and fills or any jobs that require the carrying of material, add a Gar Wood 2-Wheel Hydraulic Scraper. This Scraper rear-dumps on the level or on slopes.

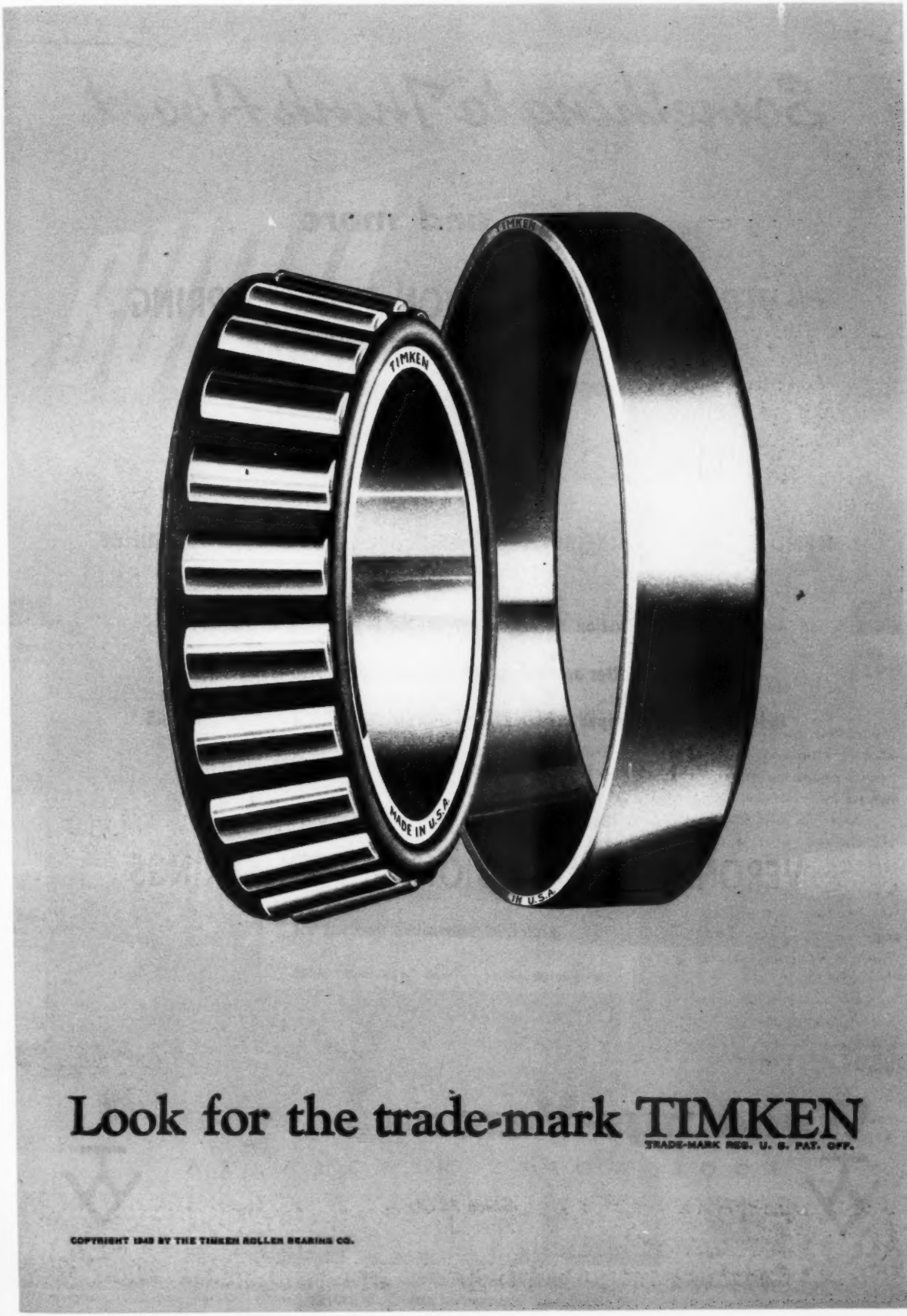


Move as much as 25 cubic yards in a single haul with the Gar Wood Cable Scraper.

GW ROAD MACHINERY is Sold Through ALLIS-CHALMERS Dealers Everywhere

ROAD MACHINERY DIVISION
GAR WOOD INDUSTRIES, Inc.
DETROIT 11, MICHIGAN

OTHER PRODUCTS OF GAR WOOD INDUSTRIES INCLUDE HOISTS AND BODIES • WINCHES AND CRANES • TANKS • HEATING EQUIPMENT • MOTOR BOATS



Look for the trade-mark TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

COPYRIGHT 1945 BY THE TIMKEN ROLLER BEARING CO.

Something to Think About

More and more

VERONA FIXED TENSION TRIFLEX SPRING

is being recognized for its unusually high reaction.

American Railway Engineering Association's Track Sub-Committee

—Subject: Bolt Tension Necessary for Proper Supporting of Rail Joints—

shows, after approximately 5 years of extensive tests,

that bolts NOT equipped with VERONA FIXED TENSION TRIFLEX SPRINGS

had tension losses, per 1/100 of an inch loss of out to out dimension,

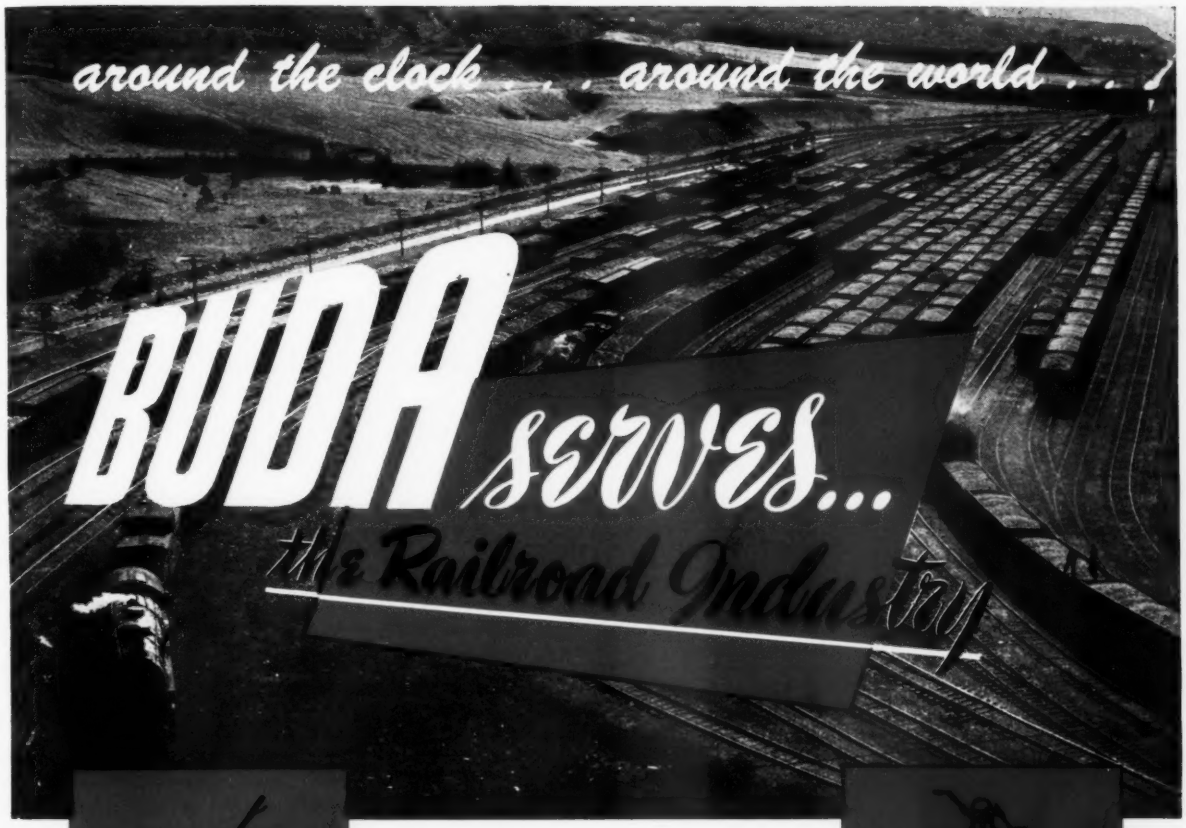
32½% to 77½% greater than bolts equipped with

VERONA FIXED TENSION TRIFLEX SPRINGS

Woodings-Verona

TOOL WORKS VERONA, PA.

Since 1873



BUDA Tie Nipper

BUDA Rail Bender

BUDA Track Liner

BUDA Track Jack

BUDA Track Drill

BUDA Crossing Gate

BUDA Wheel

BUDA Power Track Drill

Railways the world over depend on BUDA products for uninterrupted service — night and day. Wherever there are rails you'll find BUDA busy at work — justifying the 64 years of planning that have made each model the proven favorite in its field. Write or wire today for factual, illustrated bulletins.

BUDA "Klinch-Klaw" Jack

BUDA Bumping Post

BUDA Chore Boy

BUDA

15403 Commercial Avenue
HARVEY (Chicago Suburb) **ILLINOIS**

BUDA Gas, Gasoline and Diesel Engine

When You Need WEED CONTROL

Buy PROVEN CHEMICALS

AND GET:

- *Common sense analysis of your problem.*
- *Experienced service.*
- *Workmanlike equipment.*
- *Nationwide facilities.*

CHIPMAN
2,4-D WEED KILLER
(For Selective Weed Control)

CHIPMAN
CHLORAX WEED KILLER
(For Fire Protection around Poles and Trestles)

CHIPMAN CHEMICAL COMPANY, INC.

Chicago, Ill. · BOUND BROOK, NEW JERSEY · Portland, Ore.

Houston, Texas · Palo Alto, Calif. · No. Kansas City, Mo. · Winnipeg, Man.

Over Thirty-five Years of Weed Control Service

SEE FAIRBANKS-MORSE FIRST FOR MOTOR CARS

PROVED dependability, safety, and efficiency are important reasons why American railroads have used Fairbanks-Morse Motor Cars profitably for more than 50 years... important reasons why you, too, can use them to good advantage.

Most models are powered by a sturdy, two-cycle, reversible engine which has extra power for curves and grades. The lightweight is a feature especially desirable in this day of high-speed passenger and freight schedules.

There are Fairbanks-Morse Motor Cars for signal maintainers, track inspectors, superintendents, and section or bridge gangs, all made under one guarantee by one manufacturer.

Write today for full details on these economical, smooth-performing cars. Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

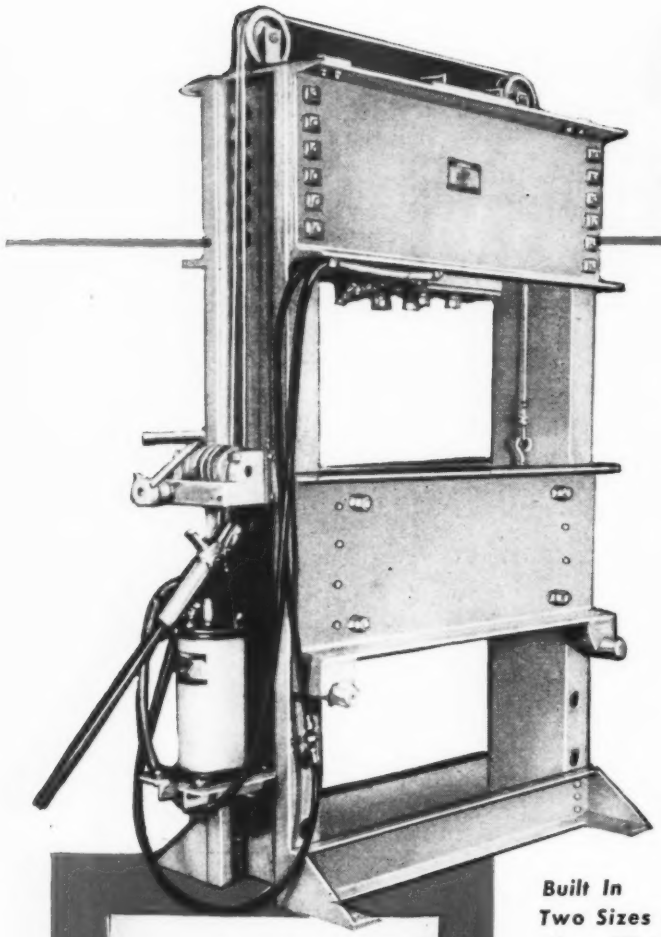
The powerful Fairbanks-Morse No. 53 car is light enough for one man to handle, yet carries a full section or bridge gang with tools. Hauls loaded trailers with ease.

Fairbanks-Morse

A name worth remembering

Diesel Locomotives • Diesel Engines
Scales • Motors • Pumps • Generators
Magnetos • Stokers • Railroad Motor Cars and Standpipes • Farm Equipment

RODGERS *flexible* SHOP PRESSES



. . . the most useful tool you can have in the shop!

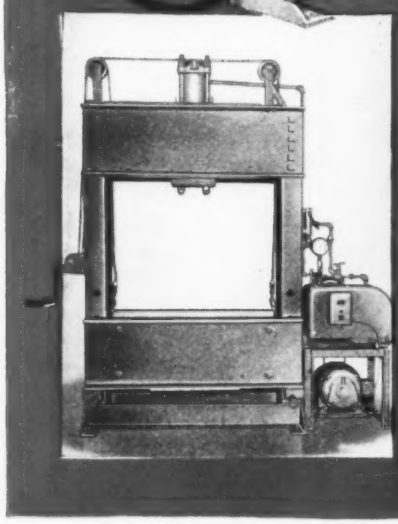
Do you have pressing, squeezing, pulling or forcing jobs around your shop? . . . little, or big, jobs that take time and trouble and special worrying to accomplish? You should have a Rodgers Shop Press—it's one of the most useful tools around *any* man's shop.

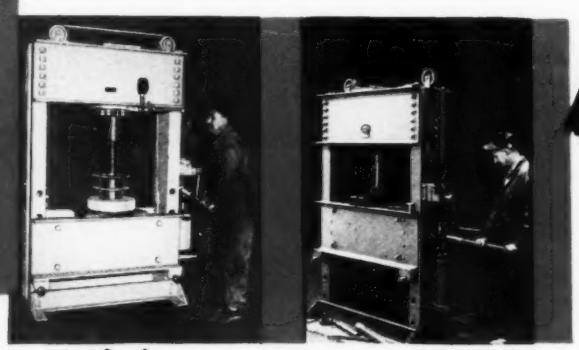
Here is why the Rodgers is such a versatile unit: it is simple and sturdy, yet so flexible that the opening between the top frame and bolster may be set from 4½" up to 32½" by adjusting the alloy steel pins upon which the bolster rests. A hand crank easily raises or lowers the bolster for adjustment. The cylinder may be mounted as shown, inside the press frame head, or hung below—and is adjustable across the entire width of the frame. Ram travel of the cylinder may be either 6½" or 13". When desirable, the press can be used resting on its side for more convenient handling of large pieces. Power is supplied by the powerful Rodgers 4-Speed Hand Pump, mounted on the press or separate, or by a Rodgers Power Pump Unit. Once you get a Rodgers, you'll say too . . . "it's one of the handiest tools in the shop."

Built In Two Sizes —

Above: 100-ton model with Rodgers Hand Pump.

Left: 150-ton model with a Rodgers 2 cyl. "D" Power Pump.



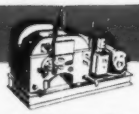


Write us today for *all* of the details . . . and our new catalog.

Rodgers Hydraulic, Inc.

hydraulic power equipment

Shop Presses



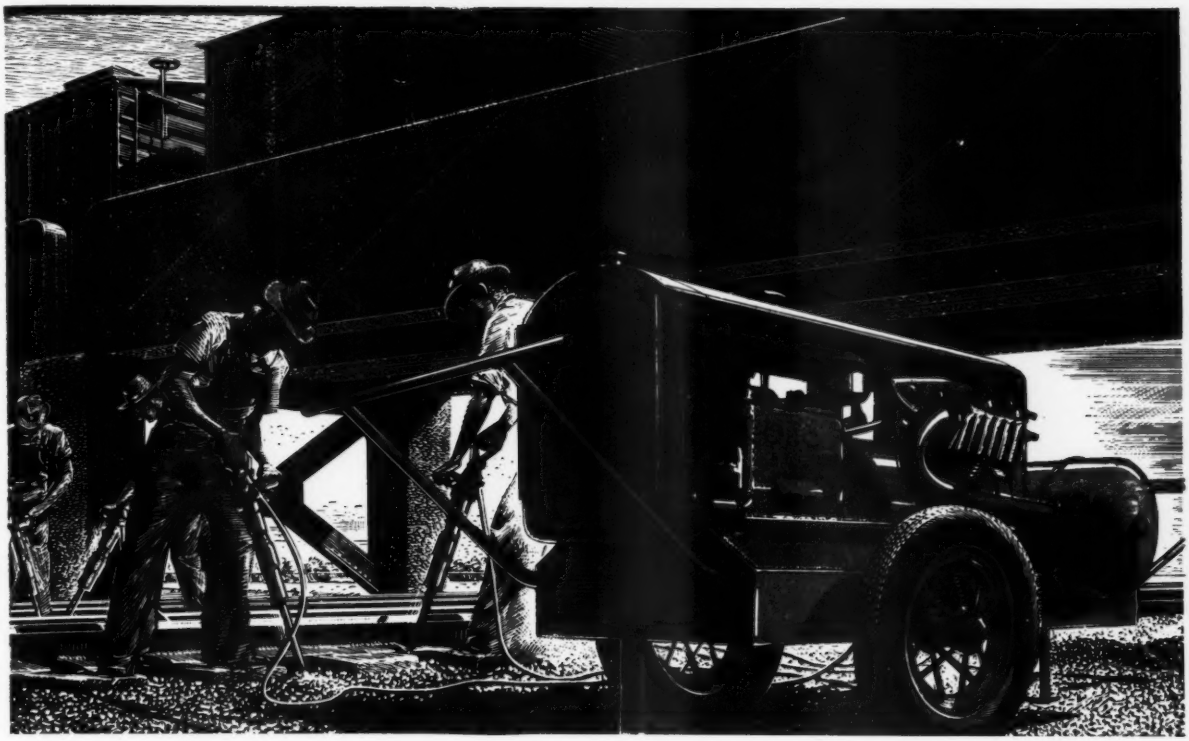
Crawler-Track Presses

Portable Presses

Power Pump Units

7458 Walker St., St. Louis Park, Minneapolis 16, Minn.

THIS SPEEDY TRACK TEAM KEEPS ITS BREATH



These fast runners don't get winded — and they make work easier for the men, too.

The Blue Brute Hand-I-Air Compressor has the easy-breathing Feather* Valve — lightest, tightest, most efficient ever made . . . handling 60 cu. ft. per min. without the slightest strain. The Hand-I-Air is compact, easily maneuverable, a cinch for two men to handle.

And those Blue Brute Tie Tampers—with their leak-proof throttles — are just as easy on themselves and on the men. No other tampers fill voids under ties so fast, yet no other tampers are as trouble-free. They're the lightest made, and they're perfectly balanced.

Also working on the railroad these days are such other Blue Brute Track Teams as: portable Diesel and gasoline engine-driven compressors and rail-car compressors teamed up with rock drills, trench diggers, backfill tampers . . . all famous for making less air do more work.

Investigate them further to see why *there's more worth in Worthington.*

Get more WORTH from air with WORTHINGTON

BUY BLUE BRUTES

*Reg. U. S. Pat. Off.

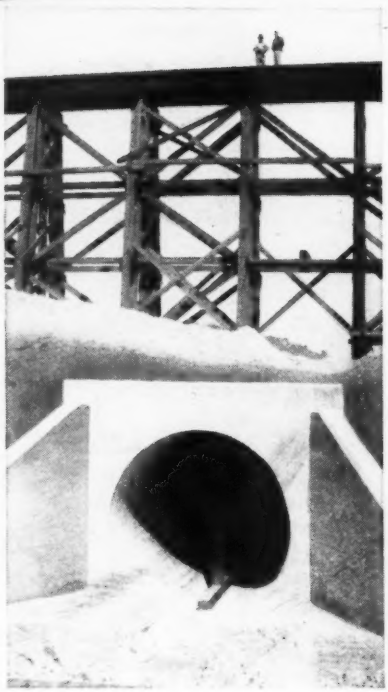
H6-5

Compressors from 60 to 500 cu. ft. capacity in mountings to suit all jobs. Rock Drills and Air Tools that have always set the pace for easy operation — available in a wide range of weights and sizes.

WORTHINGTON

Worthington Pump and Machinery Corporation, Worthington-Ransome Construction Equipment Division Holyoke, Mass.

This is the simple, practical answer *to excessive bridge repairs*



The maintenance superintendent of a main-line railroad rebuilds with ARMCO MULTI PLATE whenever a budget-eating trestle or bridge becomes unsafe.

It's easy to see why he relies on MULTI PLATE for new bridge jobs or replacements. Using these rugged structures, bridges can be "relined" or replaced without interrupting traffic. Unskilled men can assemble the curved plates quickly, bolt them together, and then backfill. Any kind of headwall design may be used with this adaptable material.

Learn how quickly you can repair or replace troublesome drainage structures with ARMCO MULTI PLATE. You'll be ahead on your modernization program if you plan now on using MULTI PLATE. Write to Armco Drainage & Metal Products, Inc., 1265 Curtis St., Middletown, Ohio.

Export: The Armco International Corporation

Armco Multi Plate

MULTI ARMCO PLATE

A PRODUCT ORIGINATED AND DEVELOPED BY ARMCO ENGINEERS

In Recognition of the new conveniences railroads are making available . . . and to point out the important work done by roadbed maintenance crews . . . Allis-Chalmers ran in four colors the advertisement reproduced here in the December 1 issue of the Saturday Evening Post.

Yes, as the new comets of the rails take you where you want to go you will enjoy greater comfort, faster, smoother travel, perhaps even the latest in entertainment. Record-breaking traffic carried so gallantly and efficiently by the railroads during the war years put a great strain on roadbeds . . . but restoration will not be a slow process. No longer are railroads limited by rail-bound maintenance equipment that can work only at hours convenient to train schedules. Construction machines — *tractors, bulldozers, scrapers* — termed "off-track equipment" because they work FREE of the rails — strengthen and widen roadbeds as trains go through on schedule.

Fast, powerful Allis-Chalmers 2-Cycle Diesel tractors work every hour of every shift. There is no interference with traffic as they quickly build up shoulders and slopes, repair washouts, clean ditches, clear slides, move snow . . . handle any grading or maintenance on short notice, anywhere, any time!

Tractors and tractor equipment build modern travelways — *roadbeds, highways, airports.* Yes, it will be fun to travel — *by train, auto or plane* — faster, smoother, with greater safety.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U.S.A.

2-CYCLE DIESEL CRAWLER TRACTORS
ROAD MACHINERY
FARM AND INDUSTRIAL WHEEL TRACTORS
FARM EQUIPMENT

UNDWORK FOR THE NEW ERA OF TRANSPORTATIO

Free

10½ x 13½ inch reprints of the POST advertisement "Travel Is Fun", attractively reproduced in four colors. Please let us know the quantity desired.

FULL FLOWING SEWERS

ARE POSSIBLE ONLY WHEN PIPES ARE COMPLETELY CLEAN

Sewers that are not clean retard water flowage often to the extent of causing flooded yards and buildings. Enginehouses and turntables become unusable and important repair work is delayed while trains must be moved to other points to be turned around. Such delays are extremely costly and time consuming.

Cleaning sewers—and all kinds of pipes—is a science with Pittsburgh Pipe Cleaner Company. Results have been outstanding because we employ specialized tools and expert engineers with many years of pipe cleaning "know-how." Just one example of our success is shown above in the pile of stones, dirt and debris removed from a 16" enginehouse sewer. Our experts can achieve the same results for your railroad.

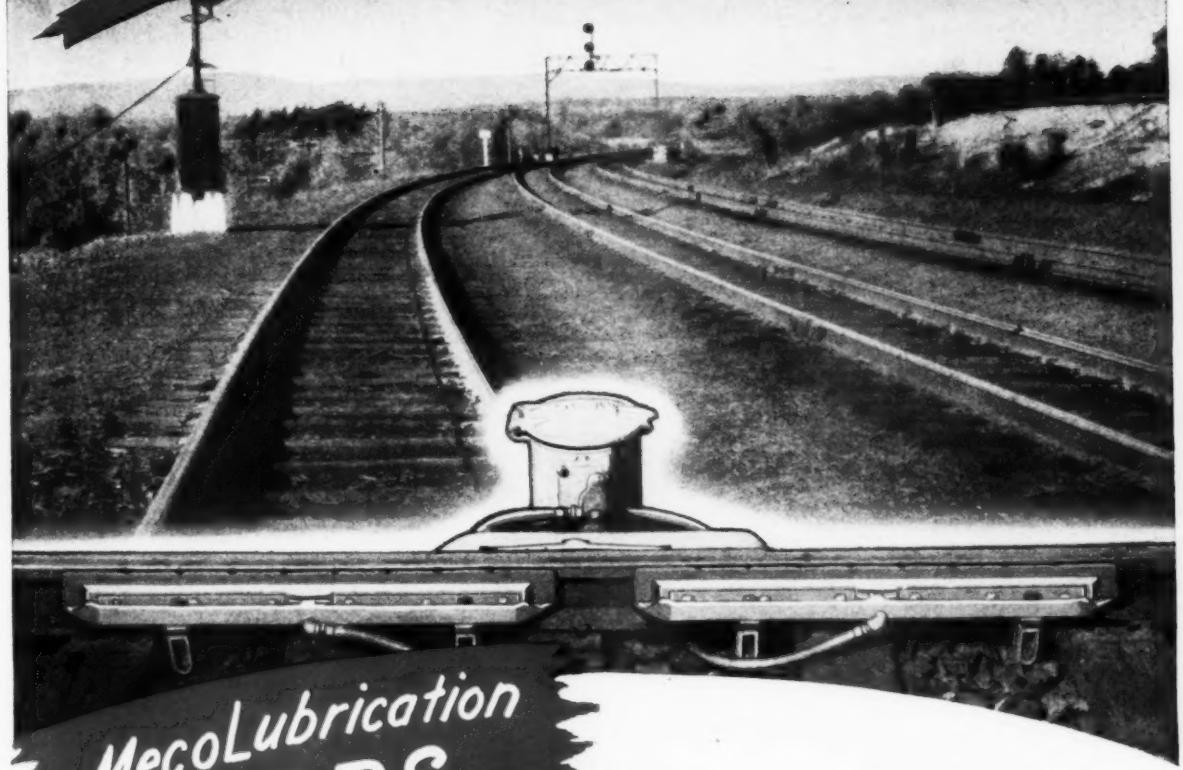
Write us today for information about our complete contract pipe cleaning service.

PITTSBURGH PIPE CLEANER COMPANY

433 MELWOOD STREET PITTSBURGH 13, PENNA

PITTSBURGH, PHILADELPHIA, BALTIMORE, WASHINGTON.
NEW YORK, BUFFALO, CHICAGO, CINCINNATI, ST. LOUIS, DETROIT

Put a Curb ON CURVE RAIL WEAR

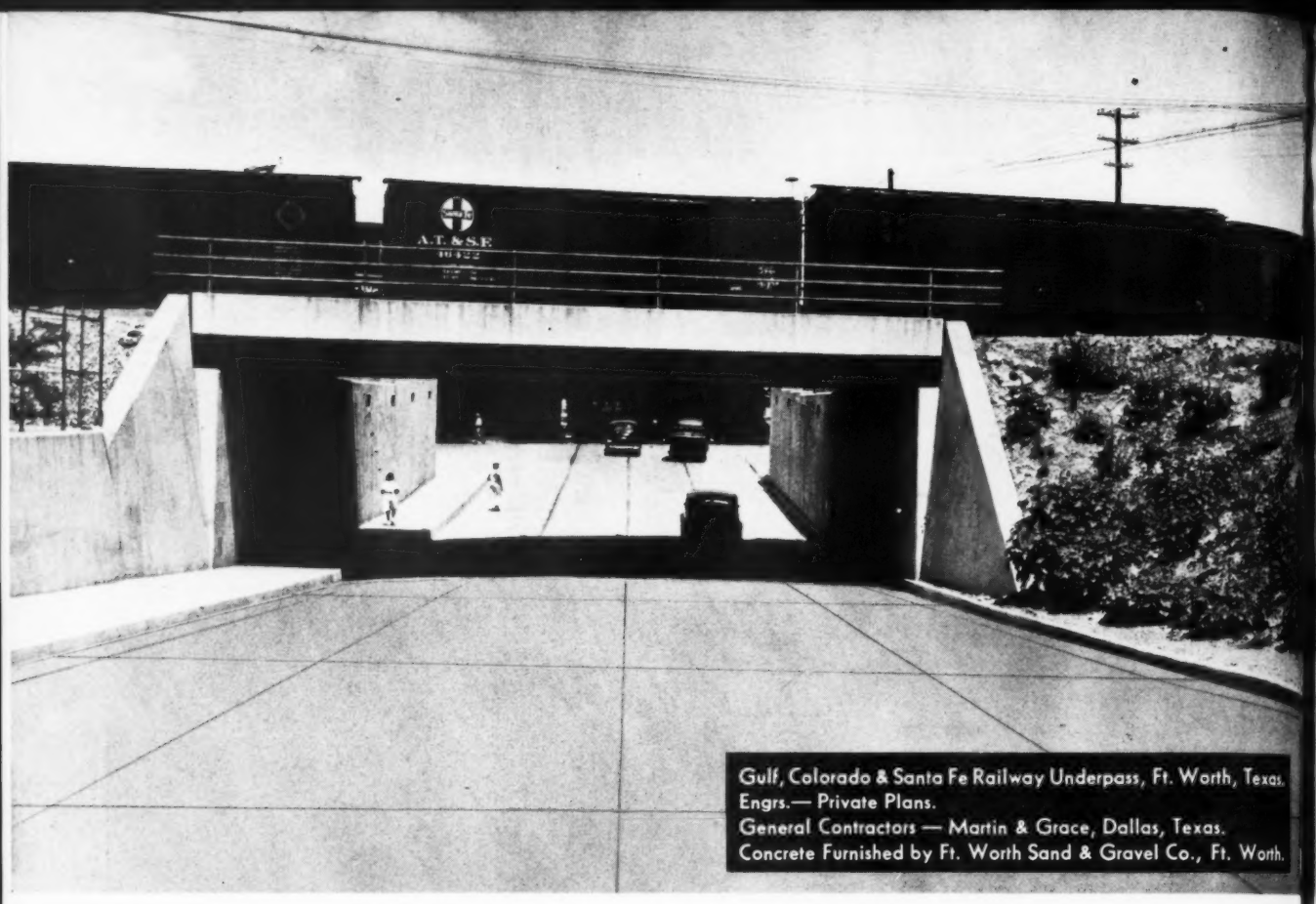


MecoLubrication CURBS Flange Friction Load

Mecolubrication increases the life of your rail in curves, 2 to 4 times. Like savings result when you lay the replacement rail and apply the same Mecos to it. Because Mecolubrication *curbs* the tremendous friction of today's enormous tonnage against curves, it greatly reduces the wear on wheel flanges and rail, and permits higher train speeds with safety. 1615

★ **Maintenance Equipment Company** ★

RAILWAY EXCHANGE BUILDING • CHICAGO, ILLINOIS



Gulf, Colorado & Santa Fe Railway Underpass, Ft. Worth, Texas.
Engrs.— Private Plans.
General Contractors — Martin & Grace, Dallas, Texas.
Concrete Furnished by Ft. Worth Sand & Gravel Co., Ft. Worth.

PLACING PROBLEM SOLVED . . . . .
GREATER DURABILITY IS A PLUS ADVANTAGE

THE contractors on this underpass found that when they used normal concrete with sufficient slump for good placing excessive bleeding resulted. Knowing that *dispersed* cement would produce the desired workability with as much as 15% less water, they used Pozzolith and solved the problem. By reducing the water-cement ratio, strengths were raised substantially.

In doing so they also greatly increased the life expectancy of the bridge. Exhaustive tests conducted by the Nation's top testing authority show that Pozzolith Concrete is 4 to 5 times more durable than plain concrete.

Providing a practical way to obtain much greater durability with higher strength, cement dispersion marks an era of new concrete standards. These higher standards already have been proved in millions of yards of Pozzolith Concrete placed since 1932.

It will pay you to get the facts on Pozzolith, Cement Dispersion for your jobs. Write today.

THE MASTER BUILDERS COMPANY
CLEVELAND 3, OHIO · TORONTO, ONTARIO

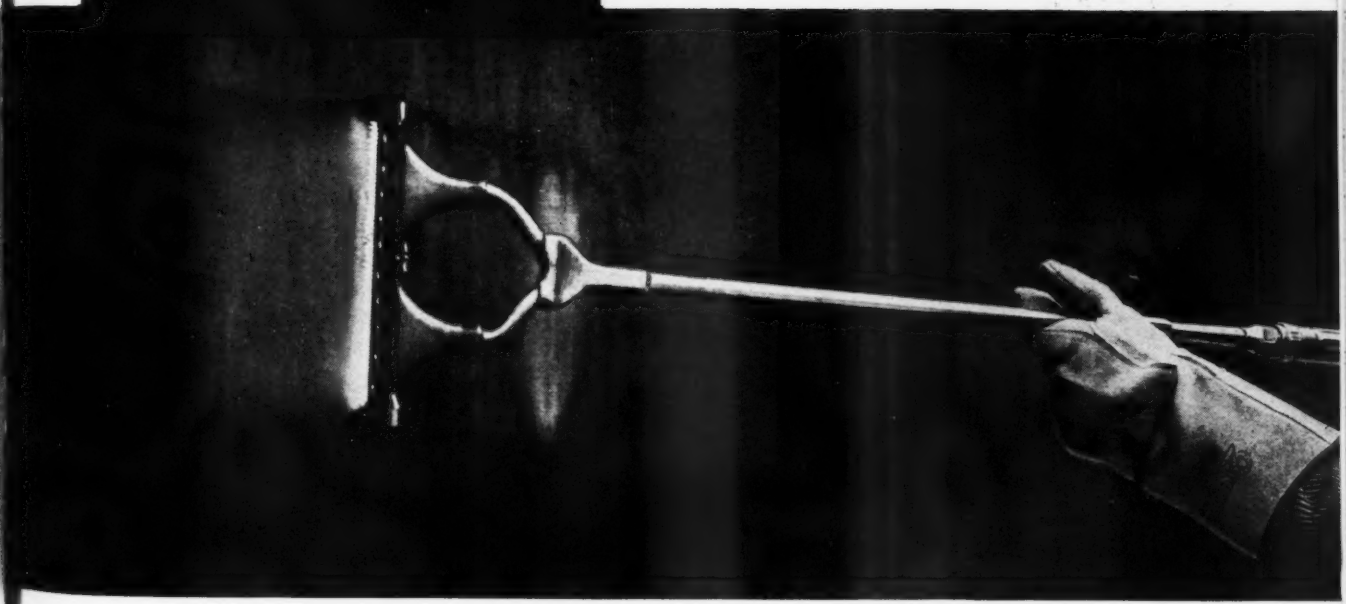
POZZOLITH

Save Time And Paint

• Old paint, rust, and scale are quickly loosened from steel under the intense heat of the oxy-acetylene flames and are easily removed by wire-brushing. When steel is warm and dry, the paint flows on more freely and less is needed than on a cold surface.

Ask Oxweld more about how to ensure a long-lasting paint job on all types of structural steel work—rolling stock, bridges, train sheds, pipe and tanks.

BY FLAME-CLEANING *Steel*



THE OXWELD RAILROAD SERVICE COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
Carbide and Carbon Building Chicago and New York

OXWELD RAILROAD SERVICE

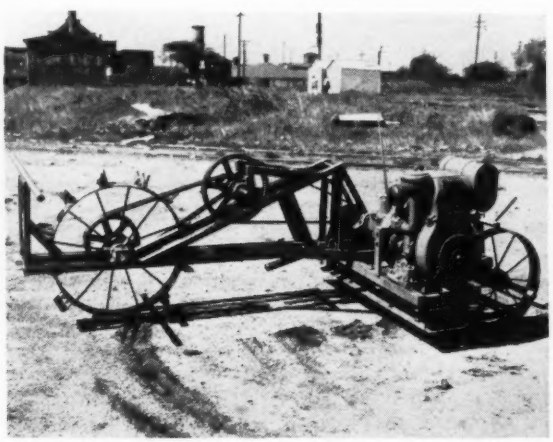
SINCE 1912—THE COMPLETE OXY-ACETYLENE SERVICE FOR AMERICAN RAILROADS

SAVE LABOR, TIME, DO IT BETTER

WITH *KERSHAW TRACKWORK MACHINES*

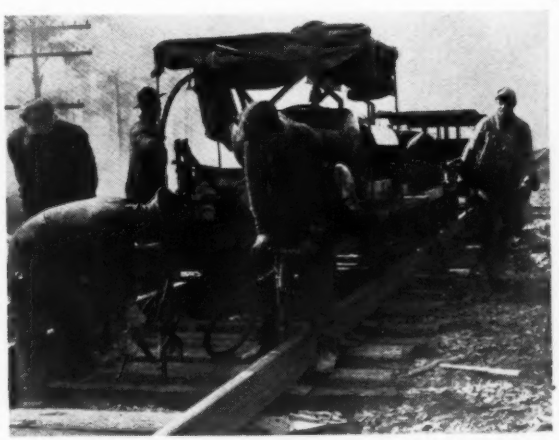
Developed As A Necessity By A Railroad Contractor, Now Being Manufactured For The Railroads

All of these machines were developed and built by a railroad contractor who keeps very accurate and detailed cost on every operation of constructing or reconditioning trackwork. For example, the cost of stripping track by hand was approximately $750.00 to $1,000.00 per mile; with the machine it cost $300.00 to $500.00 per mile. All of these machines have more than paid for themselves in labor savings in less than 10 miles of work.



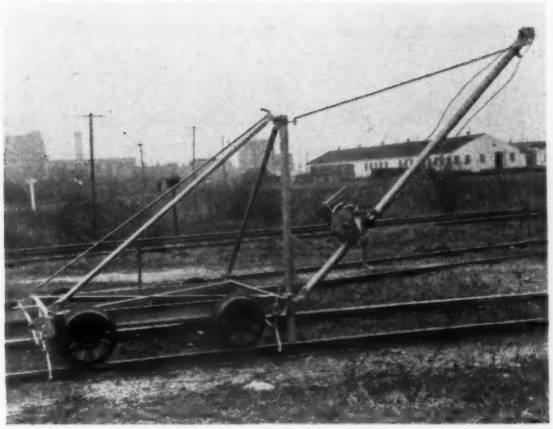
1. **Cribbing Machine.** (Patent applied for.) Operated by three men and used for cribbing ahead of adzing machines in relaying operations. Capacity 8,000 ft. daily.

2. **Ballast Remover and Track Skeletonizer.** (Patent applied for.) Operated by two men and used for removing all old ballast between ties and under rail. Will also remove ballast under ties for lowering track. Capacity 1,000 ft. daily.



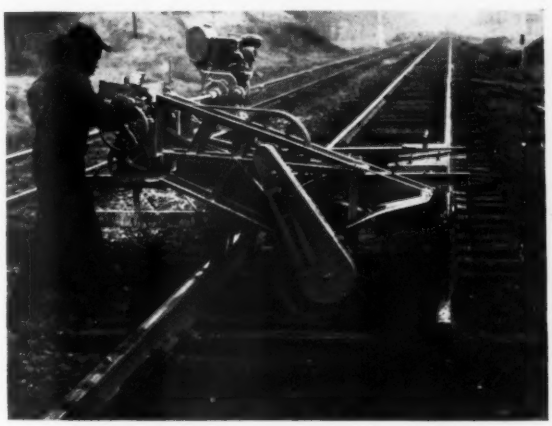
3. **Pneumatic Tie Nipper and Spike Driver.** (Patent applied for.) Operated by six men behind gauging crew. Will spike up track solid as fast as crew gauges every fourth tie. Capacity 2,500 ft. daily.

4. **Rail Laying Crane.** Operated by four men and used in relaying operations or new construction. Self propelled three speeds forward and reverse. Will set in one rail every minute.



5. **Two Ton Derrick.** (Patent applied for.) Operated by four men and used on single track in relaying operations for removing and setting on relaying equipment. Will remove all equipment and clear track in 6 minutes. completely dismounted and removed from track with four men in 40 seconds.

6. **Ballast Plow and Regulator.** (Patent applied for.) Operated by three men. Plows ballast from center of track, regulates and dresses ballast slope to desired cross section. With three men operating on machine and six shovel men behind will completely dress 2,500 ft. daily.



7. **Ballast Remover.** (Patent applied for.) Operated by three men and used to strip track in yards, station grounds, underpasses, cuts, and tunnels where clearances are limited; also used for cleaning out ballast in tie replacement. Will strip 800 ft. track daily.

MAKE YOUR OWN COMPARISON:

OPERATION	BY HAND LABOR	KERSHAW MACHINE	SAVING
1. Cribbing Track for Relaying*	$316 per mile	$38 per mile	$278 per mile
2. Stripping Track for Reballasting*	$910 per mile	$300 per mile	$610 per mile
3. Spiking Track Solid behind Gauge	18 men	6 men	12 men
4. Setting in Rail, Relaying or Const.	16 men	4 men	12 men
5. Removing & Replacing Relay Equip.	30 minutes	10 minutes	20 minutes
6. Dressing Track	$780 per mile	$310 per mile	$470 per mile
7. Stripping Track in Yards, Crossings, Underpasses, etc.*	$ .26 per ft	$ .12 per ft	$ .14 per ft

*All cost based on operation by hand and machine in old cemented limestone and slag ballast. In loose material the cost may be reduced by ⅓.

WRITE
PHONE
WIRE

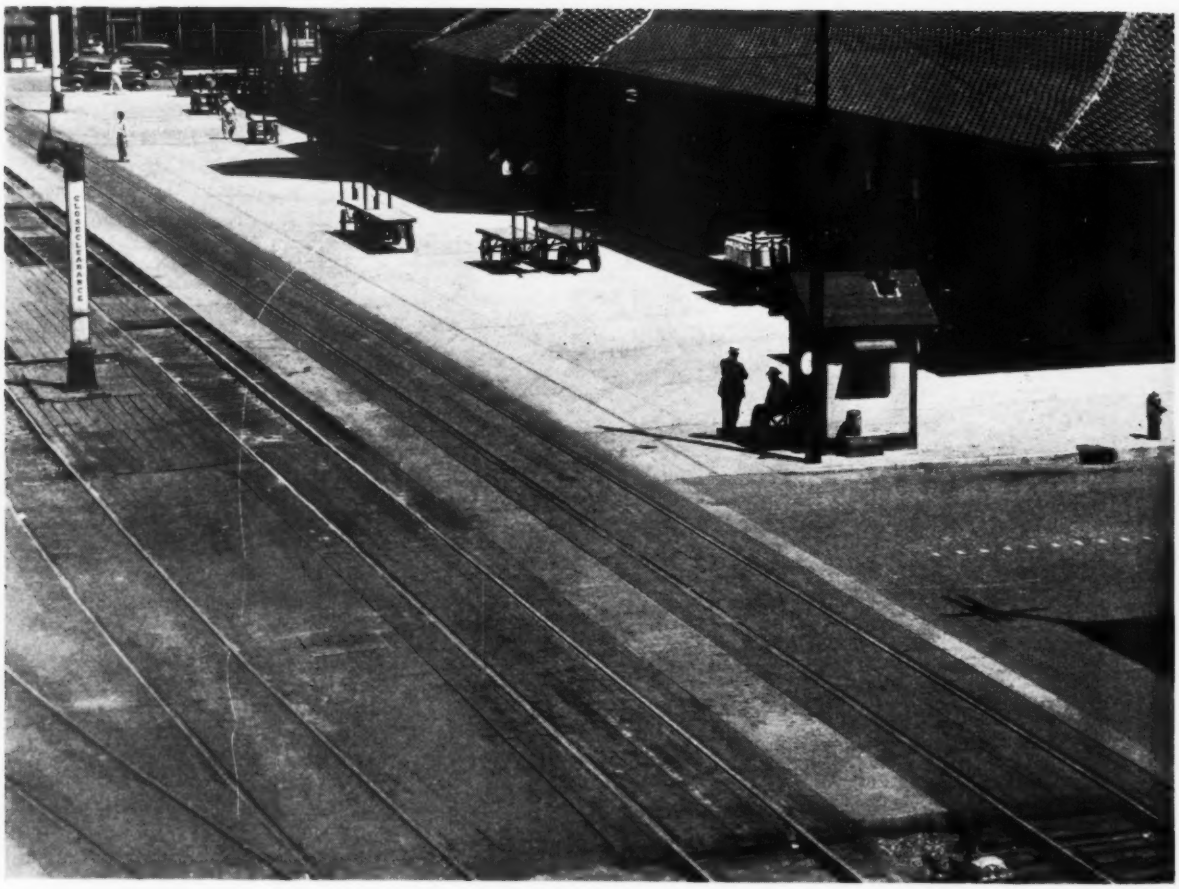
For complete information, descriptive folder, prices—

THE KERSHAW COMPANY, INC.

P. O. BOX 510 **MONTGOMERY, ALABAMA**

TRACK WORK • CONSTRUCTION & MAINTENANCE EQUIPMENT
KERSHAW
MONTGOMERY, ALABAMA
LABOR SAVING

MOSS CROSSINGS
Were Designed For Heavy Duty



Because railroad engineers and maintenance men wanted a highway crossing which would stand up under heavy duty—Moss sectional highway crossings were created.

Moss Crossings can take it—these sturdy, well-built sections rest squarely upon the cross ties through the crossing, giving you a solid mass of wood to take the shock of heavy traffic and distribute it downward to be absorbed by the track foundation.

The first of these Moss Crossings was placed in service 15 years ago, and has taken a daily beating since that time, without appreciable deterioration.

We're in better position to serve you than ever before. Whether your requirements call for a single-track 16′ crossing or a multiple-track one running 72′ or longer, we can make shipment for installation this spring.

Please pass this ad on to any others in your organization who might be interested in these crossings.

CROSS TIES
SWITCH TIES
POLES & POSTS
PILING
CROSSINGS

T. J. MOSS TIE COMPANY

The Stamp of Character MTC

FOUNDED 1879

700 SECURITY BUILDING ST. LOUIS, MISSOURI

WOOD PRESERVING PLANTS
MT. VERNON, ILL.
EAST ST. LOUIS, ILL.
GRANVILLE, WIS.
SHREVEPORT, LA.
COLUMBUS, MISS.

Off-the-Track Equipment PAYS OFF!

ADAPTABLE, MOBILE LINK-BELT SPEEDER MACHINES DO *More* WORK . . . *More Kinds* OF WORK . . . *More of the Time!*

Then There's the **CARGOCRANE,**

the nimble wheel-mounted crane that finds numerous uses in yards, stores, repair shops and freight-handling points. Capacities up to 10 tons.

Traffic and maintenance work proceed together—without interference, when modern, versatile Link-Belt Speeder machines are used. Quickly convertible to dragline, shovel, trench-hoe, pile-driver, or simple hook-block, they will perform a multitude of jobs of routine or emergency nature.

Railroad men appreciate the rugged construction that enables them to deliver trouble-free service, the power and smooth, efficient operation that accounts for high capacity for work.

Twenty-five models include a size for every requirement.

10,171

LINK-BELT SPEEDER

Builders of the Most Complete Line of
SHOVELS-CRANES-DRAGLINES

LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO-9, ILL.
(A DIVISION OF LINK-BELT COMPANY)

READY TO FABRICATE SURPLUS aluminum

AT 15% TO 45% LESS
(FOB Location)

GOVERNMENT-OWNED STOCK

Here—in production quantities—is the aluminum you need at fixed prices, 15% to 45% off current mill prices, depending on the particular alloy. Much of this special value stock, originally ordered for war plane construction, is still in its original packing. It may be readily fabricated and is available in standard sizes and shapes. Perhaps this material is just what you need to get into full civilian production faster and it costs nothing to find out. Take these three simple steps today:

1. Estimate, for any convenient period, your production needs in each specification, finish, gauge, etc.

2. Then write, wire, or phone that data to your nearest War Assets Corporation office* below. We will advise you of the location of the stock you need, estimate possible delivery dates, quote prices and help arrange credit where indicated.

3. When satisfactory arrangements have been made, we will start shipments.

*NEW SURPLUS STOCK RELEASED DAILY

War Assets Corporation is a Reconstruction Finance Corporation subsidiary in charge of disposing of surplus war materials constantly being released to War Assets Corporation. To reach War Assets Corporation, simply contact your nearest R.F.C. office listed below.

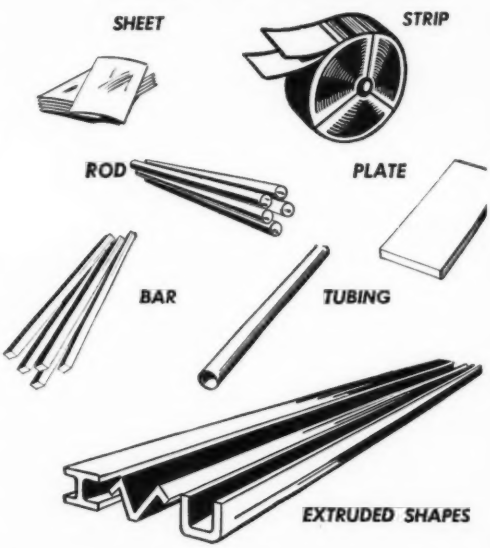
VETERANS OF WORLD WAR II:

To help you in purchasing surplus property from War Assets Corporation, a veterans' unit has been established in each War Assets Corporation Regional Office listed below.

ATTENTION
POWDER METALLURGISTS!

Atomized Aluminum powder —not suitable for paint without further processing—is available in enormous quantities at 10¢ per pound. Can you find a major use for this product? If you can.....!!! Get detailed specifications from your War Assets Corporation office listed below.

TYPES AVAILABLE



A DISPOSAL AGENCY DESIGNATED BY THE SURPLUS PROPERTY ADMINISTRATION for Surplus Producers' and Capital Goods, Aircraft and Plants formerly handled by Reconstruction Finance Corporation . . . and for Surplus Consumer Goods formerly handled by United States Department of Commerce.

WAR ASSETS CORPORATION

(A SUBSIDIARY OF RECONSTRUCTION FINANCE CORPORATION)

RFC OFFICES (INCLUDING FORMER DEPARTMENT OF COMMERCE REGIONAL SURPLUS PROPERTY OFFICES) LOCATED AT: Atlanta • Boston • Chicago • Denver • Kansas City, Mo. • New York • Philadelphia • San Francisco • Seattle • OTHER RFC SURPLUS PROPERTY OFFICES LOCATED AT: Birmingham • Charlotte • Cleveland • Dallas • Detroit • Helena • Houston • Jacksonville • Little Rock • Los Angeles • Louisville • Minneapolis • Nashville • New Orleans • Oklahoma City • Omaha • Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • Spokane • OTHER FORMER DEPARTMENT OF COMMERCE REGIONAL SURPLUS PROPERTY OFFICES LOCATED AT: Cincinnati and Fort Worth

157-3

I NEED WELL DRAINED TRACK—

says modern high speed traffic

...and **experienced maintenance men find effective, low cost answer in the JORDAN SPREADER-DITCHER**

Establishing true road-bed section and a clean, effective ditch essential for proper drainage—Standard Type Spreader-Ditcher at work.

Dragging dirt from a cut and widening the fill—Type A Spreader-Ditcher with both wings converted to carrier wing position.

TRACK that lacks proper drainage quickly becomes costly track to maintain —especially under the steady punishment of vast modern tonnages and growing high speeds. Moral—use the JORDAN. This huge, powerful "mechanical crew" was developed by railroad men *to answer a difficult, costly maintenance problem*—which it did. It performs a wide variety of essential maintenance tasks—cuts ditches, shapes roadbed, plows ballast, moves earth and clears snow-bound track: and does these essential tasks faster, with big savings of manpower and dollars.

To *see* the Jordan at work—for railroads, on industrial plant jobs, in mining operations—write for the new Jordan Book: contains over 100 action and detail pictures. Sent only to industrial executives' requests on business letterheads.

O. F. JORDAN COMPANY

WALTER J. RILEY, *President*

EAST CHICAGO, INDIANA

CP Flanged Wheel Compressors
CP Tie Tampers

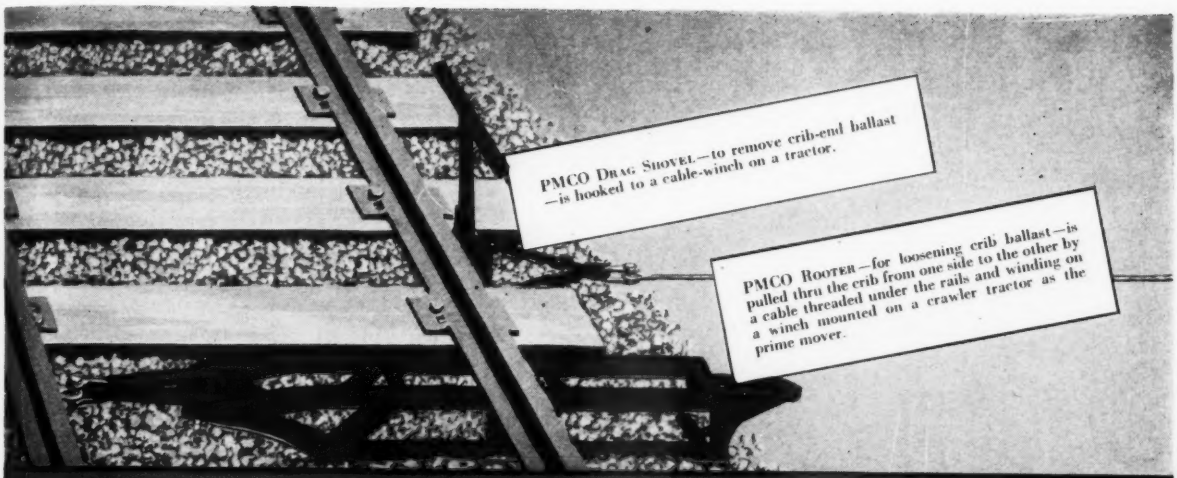
CP Self-Propelled, Two-Stage, Air-Cooled Compressors give from 15% to 35% more air per gallon of fuel, an economy possible through gradual speed regulator, varying speed gradually up and down exactly with air demand! Self-propelling drive is sturdy and reliable — there are no complicated gears or clutches. Unit consists of CP gasoline or Diesel-driven compressor, mounted on flanged wheel truck. Self-propelled and non-self-propelled models of CP Compressors are available in sizes from 60 c.f.m. to 500 c.f.m. actual capacity.

To take full advantage of portable compressor capacities, use CP Tie Tampers — noted for their ease of handling as well as low air consumption. CP Tie Tampers are efficient in "nipping" and on small rises — also on jobs where the track is raised several inches.

★★★★★★★★★
PNEUMATIC TOOLS
ELECTRIC TOOLS
HYDRAULIC TOOLS
ROCK DRILLS

CHICAGO PNEUMATIC
TOOL CP COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

★★★★★★★★★
AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES


PMCO Drag Shovel—to remove crib-end ballast—is hooked to a cable-winch on a tractor.
PMCO Rooter—for loosening crib ballast—is pulled thru the crib from one side to the other by a cable threaded under the rails and winding on a winch mounted on a crawler tractor as the prime mover.

APPLY MODERN EARTH MOVING METHODS IN SKELETONIZING TRACK

The New
PETTIBONE MULLIKEN CRIBBING SET

ROOTER • DRAG BUCKET • DRAG SHOVEL

Saves $1,000 *per mile*
$100,000 *per* 100 *miles*

Eliminates (pick and shovel) hand methods
Eliminates monotony and drudgery of hand cribbing
Maintains satisfied crews
Speeds up skeletonizing 500%

Write Today for Bulletin No. 1500

"Quality Since 1880"

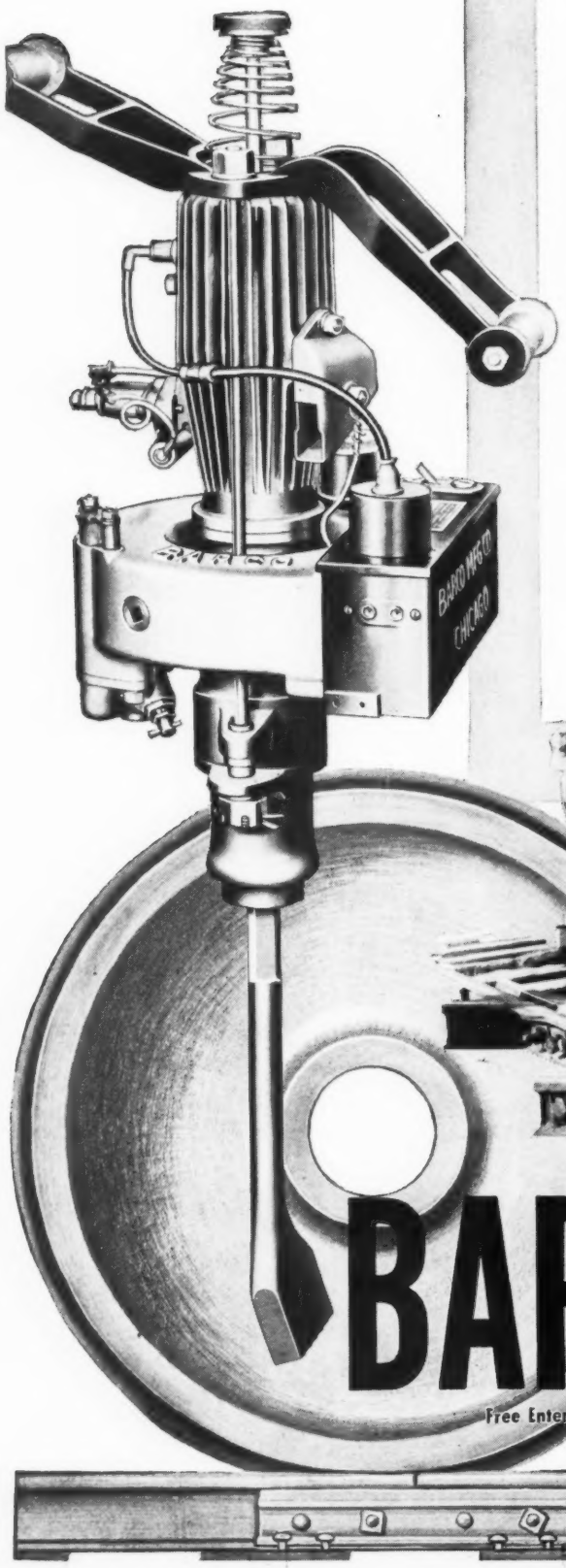
PETTIBONE MULLIKEN CORPORATION

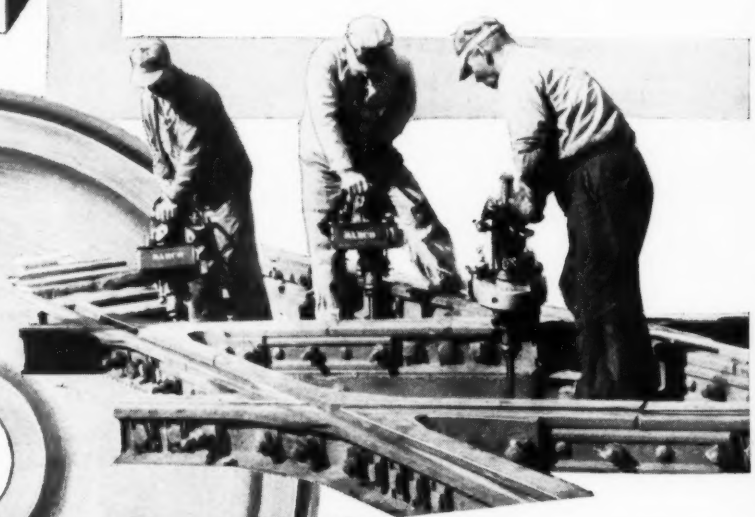
4710 West Division Street, Chicago 51, Illinois

HEAVIER TRAFFIC

needs well-anchored roadbeds

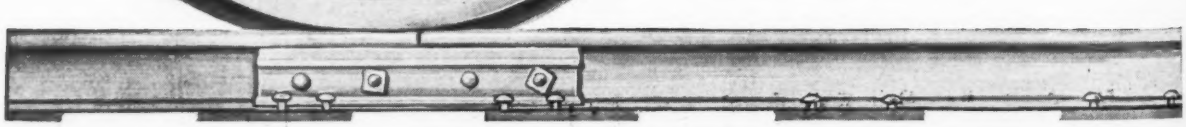
ROADBEDS need firmly tamped ballast and constant maintenance service in these days of higher train speeds and heavier wheel loads. Any worker, whether alone or in a gang, will do more work per shift when equipped with the light, powerful Barco Unit Tytamper. Tireless, strong, compactly built with ignition system attached, Barco Tytampers mean time and labor saved on any job of breaking and crib-busting. Barco Manufacturing Company, Not Inc., 1805 Winnemac Avenue, Chicago 40, Illinois. In Canada: The Holden Co., Ltd., Montreal, Canada.





BARCO UNIT TYTAMPERS

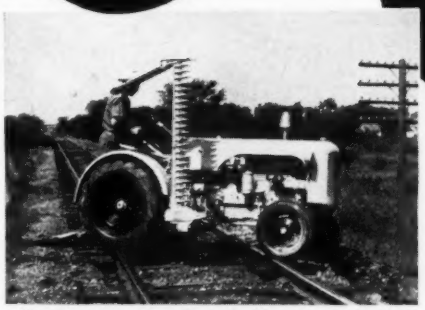
Free Enterprise—The Cornerstone of American Prosperity



LE ROI "TRACTAIR"

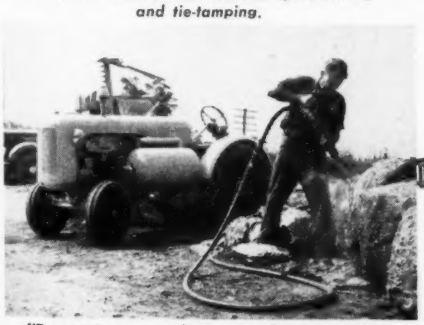
(A Tractor-Compressor)

speeds right-of-way maintenance



"Tractair" crosses rails and all types of terrain with little difficulty.

"Tractair" makes short work of spike-driving and tie-tamping.



"Tractair" gets up close — and puts a wallop behind your air tools.

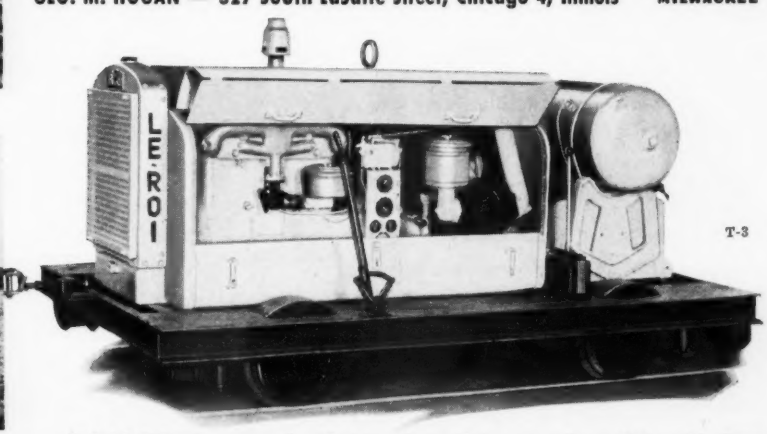
The Le Roi "Tractair" is a self-propelled, pneumatic-tired tractor-compressor that combines all of the features of an efficient, mobile 105 c.f.m air compressor with the flexibility and utility of a 35 h.p. wheel tractor. All pneumatic tools used in railroad maintenance that can be operated from a 105 ft. compressor can be handled efficiently by the "Tractair." The large pneumatic tires are equally as adaptable to adverse right-of-way conditions as they are to paved terminal facilities.

A complete line of interchangeable "front end" equipment such as loader, snow plow, rotary broom, back-fill blade, cargo and material lifts, crane arm, etc., as well as a mobile magnet pickup for cleaning scrap iron from right-of-way are now being developed.

For complete details and bulletins write to the Railroad Sales Dept.

LE ROI COMPANY
RAILROAD SALES DEPARTMENT
GEO. M. HOGAN — 327 South LaSalle Street, Chicago 4, Illinois

LE ROI
MILWAUKEE



T-3

Le Roi Rail Car Compressor furnished in self-propelled or non-self-propelled models. Sizes: 105, 160, 210 and 315 c.f.m. with gasoline or Diesel power. Chilled wheels, hydraulic jacks, and electric starting are standard equipment

Fairmont

THE

ORIGINAL DEMOUNTABLE WHEEL

Fairmont introduced the original demountable motor car wheel over 16 years ago. Before being introduced, the design was carefully studied, then followed many laboratory tests and actual field tests.

Today, because of Fairmont thoroughness and quality production, this wheel is the best obtainable. It has always been cold formed, the recognized method for producing a tire of maximum service.

Long lived and true running, Fairmont demountable wheels are regularly checked and rechecked in our laboratory to maintain their high standard. Unquestioned in leadership, your needs for push car, trailer, and motor car wheels can best be filled by Fairmont, the original demountable wheel.

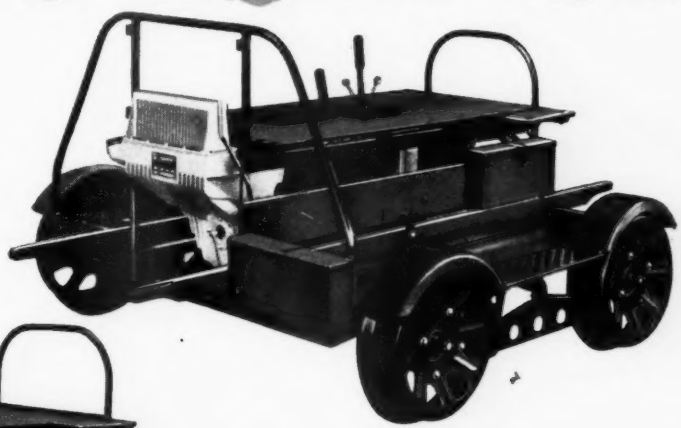
FAIRMONT RAILWAY MOTORS, INC., FAIRMONT, MINN.

Fairmont

PERFORMANCE ON THE JOB COUNTS

INSPECTION CARS

These cars are built in five different models to suit any and all inspection car needs. All have demountable wheels, water cooled condenser equipped engines with either ball or roller bearings, and embody efficiency, light weight, and long life. The illustration is of the M19 Series E one to four man car with spring mounted aluminum frame.



SECTION CARS

There are five models of Fairmont light and standard section cars, enough to meet any requirement. All of them have water cooled engines, either ball or roller bearings, and combine simplicity with economy and long life. They can be fitted with a two-speed gear for greater drawbar pull. Pictured here is the S2 Series F standard eight man section car.

GANG CARS

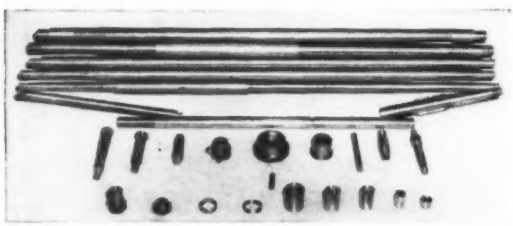
Three sizes of gang cars from 17 to 85 horsepower, meet all gang car requirements. They have four or eight cylinder engines, propeller shaft drive and an enclosed reverse that permits the cars to be operated in four different speeds in either direction. Shown here is the A5 Series C.

OF ALL THE CARS IN SERVICE TODAY—MORE THAN HALF ARE FAIRMONTS

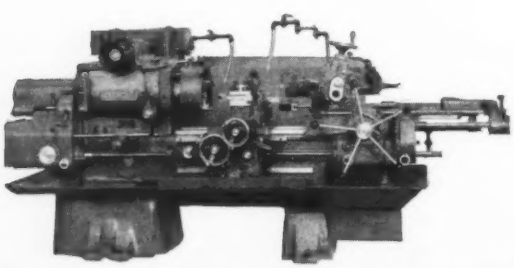
FAIRMONT RAILWAY MOTORS, INC., FAIRMONT, MINN.

Machining piston rods for the "Automatic Switchman." With machining reduced to ¼ of former time, a year's supply becomes a short order. Costs are cut to the bone, too.

Cutting THE COST OF REPAIR PARTS FROM 50 to 80% FOR MAINTENANCE OF WAY EQUIPMENT



Here are 27 different parts, all produced on this one Gisholt machine at from ½ to ⅕ of previous costs. They include shafts and axles of different types, pistons, bushings, collars and bearing retainers, valves, plugs, etc. These are samples of both bar and chucking work made of brass, cast iron and steel. Some were previously produced on engine lathes, others purchased from outside sources.



This Gisholt No. 5 Ram Type Turret Lathe is shown with attachments and tooling for general chucking work. It is also equipped for handling bar work as shown in photos above.

If you want to save money on replacement parts, here's an idea that will interest you. It's a simple idea—and it *works*—wherever modern Gisholt Turret Lathes take over the production of standard parts like these.

In this shop, for example, a Gisholt No. 5 Ram Type Turret Lathe is used exclusively to turn out repair parts for maintenance of way equipment, such as for motor rail cars, gang cars and trailers, mechanical switchmen, lubricators, track drills, wrenches, jacks, etc. This *one machine* produces this variety of parts at an estimated saving of $14,000 per year—enough to repay the entire investment every eight months!

Here, too, is an example of the way Gisholt engineers work with you all the way. They analyze your problems, show you the most practical methods, figure your costs, provide tooling for each specific job and help train the operator.

Men charged with the responsibility of keeping maintenance of way equipment operating at lowest costs should investigate Gisholt service. Write for complete information.

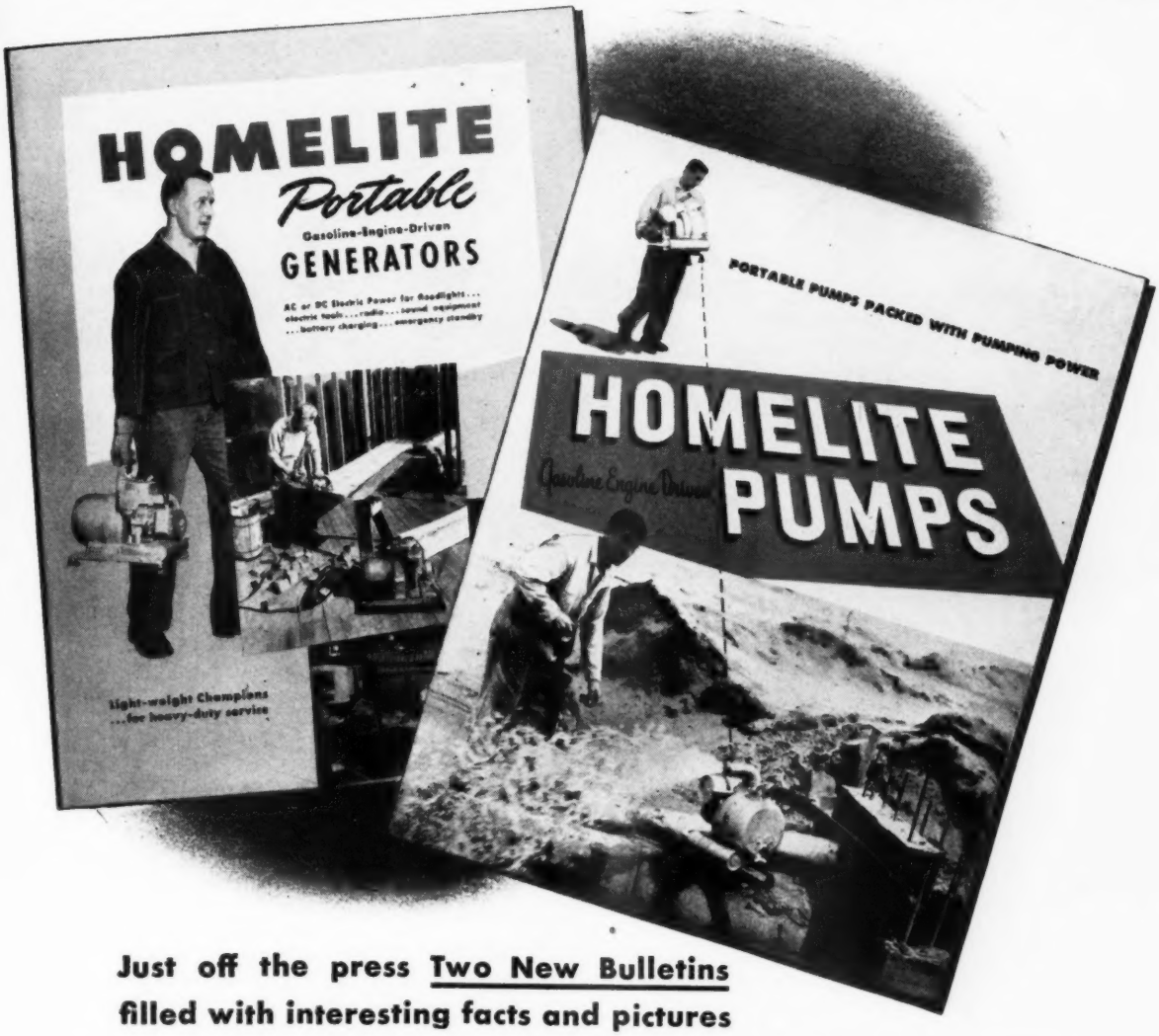
GISHOLT

GISHOLT MACHINE COMPANY
1247 E. Washington Avenue, Madison 3, Wisconsin

Look Ahead...Keep Ahead...with Gisholt

Here's the Latest Information

on Homelite Portable Pumps and Generators



Just off the press Two New Bulletins filled with interesting facts and pictures

- ★ See what these portable gasoline-engine-driven pumps and generators can do for you.
- ★ See the new and greatly improved models.
- ★ See their new light weight, capacity and output.
- ★ See the design and performance advancements that have resulted from our production of more than 200,000 Homelites for the Armed Forces.
- ★ Write for these free bulletins today. Specify Generator Bulletin L-406 or Pump Bulletin L-501.

Homelite Corporation

Portable PUMPS • GENERATORS • BLOWERS

PORT CHESTER, NEW YORK

BRANCH OFFICES

Albany, N. Y.
Atlanta, Ga.
Baltimore, Md.
Boston, Mass.
Buffalo, N. Y.
Chicago, Ill.
Cincinnati, O.
Cleveland, O.
Dallas, Tex.
Detroit, Mich.
Hartford, Conn.
Kansas City, Mo.
Los Angeles, Cal.
New York, N. Y.
No. Arlington, N. J.
Orlando, Fla.
Philadelphia, Pa.
St. Louis, Mo.
San Francisco, Cal.
Seattle, Wash.

DEALERS

Pittsburgh, Pa. — C. K. Koontz Equipt. Co.
Denver, Col. — George F. Hastings
Minneapolis, Minn. — The Midwest Equipt. Co.

Canadian Representative: Terry Machinery Company Ltd.

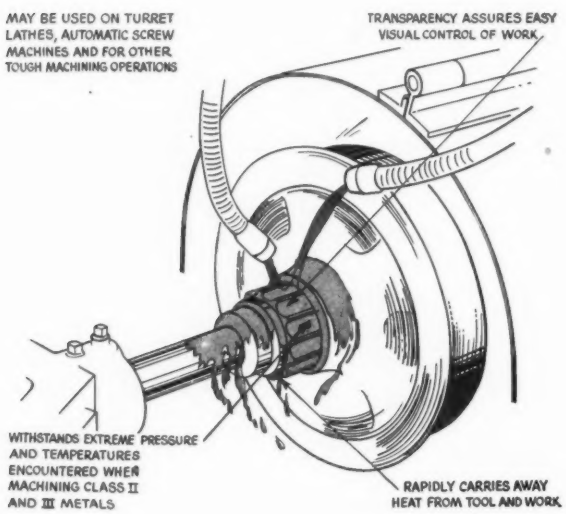
STANDARD ENGINEERS NOTEBOOK

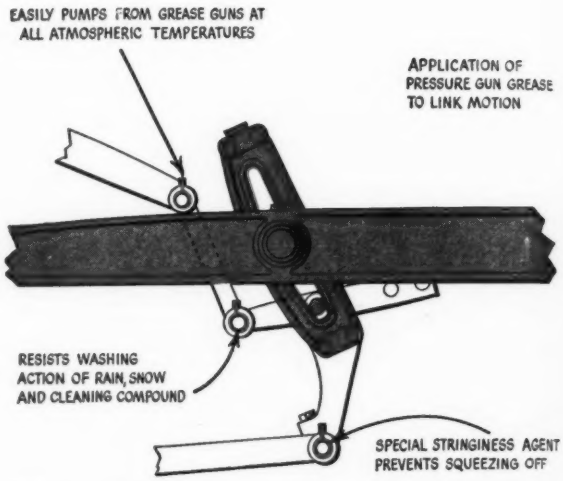
Potent cutting oil produces good surface finish

When machining Class II or Class III metals many operators have found the high lubricating value and extreme pressure quality of Calol Cutting Oil—20TA ideal for producing the desired finish. Because it is transparent, Calol Cutting Oil—20TA affords a machine operator complete visual control of work.

This special cutting oil is made from highly refined oils and compounds which give it unusual potency and transparency. It is an excellent coolant —carries heat away rapidly from tools and gives them longer service life.

Recommended for tough work, Calol Cutting Oil—20TA is used on turret lathes, automatic screw machines, etc. It can be used when machining brass or bronze where slight staining is not objectionable and work is cleaned or pickled after machining.


MAY BE USED ON TURRET LATHES, AUTOMATIC SCREW MACHINES AND FOR OTHER TOUGH MACHINING OPERATIONS
TRANSPARENCY ASSURES EASY VISUAL CONTROL OF WORK
WITHSTANDS EXTREME PRESSURE AND TEMPERATURES ENCOUNTERED WHEN MACHINING CLASS II AND III METALS
RAPIDLY CARRIES AWAY HEAT FROM TOOL AND WORK


EASILY PUMPS FROM GREASE GUNS AT ALL ATMOSPHERIC TEMPERATURES
APPLICATION OF PRESSURE GUN GREASE TO LINK MOTION
RESISTS WASHING ACTION OF RAIN, SNOW AND CLEANING COMPOUND
SPECIAL STRINGINESS AGENT PREVENTS SQUEEZING OFF

Shock-resistant lubricant prolongs life of parts

Calol Pressure Gun Grease will add many miles of service to locomotive bearings, valve motion parts, shoes, wedges, hub liners and other parts requiring pressure gun grease. It is made especially to withstand continuous hammering shocks without squeezing or rubbing off bearing surfaces.

A special stringiness agent, added to the heavy-bodied oil and water-resistant-type soap from which Calol Pressure Gun Grease is made, provides its great shock resistance and allows surplus grease to feed slowly from the reservoir to bearing surfaces.

Calol Pressure Gun Grease is water-resistant. This prevents washing away or any change in its characteristics when in contact with rain, ice and snow on a run, or cleaning solutions in the yards.

There are two grades of Calol Pressure Gun Grease. Winter, actually an all-year lubricant. Summer, a special grade for unusually severe service.

For additional information and the name of your nearest Distributor, write Standard of California, 225 Bush Street, San Francisco 20, Calif.; The California Oil Company, 30 Rockefeller Plaza, New York 20, N. Y.; The California Company, 17th and Stout Streets, Denver 1, Col.; Standard Oil Company of Texas, El Paso, Texas.

FOR EVERY JOB A **STANDARD OF CALIFORNIA** TEST-PROVED PRODUCT

EFFICIENT—ECONOMICAL

Achieving the double "E" (efficiency, economy) in ballast cleaning is what makes "MOLE" Ballast Cleaners so valuable to the 31 major railroads where they are in service. Important improvements to the new model "MOLE" add to the life of machine parts, facilitate maintenance, and increase its working range. Now, intertrack ballast with centers 12′ to 15′ can be cleaned readily.

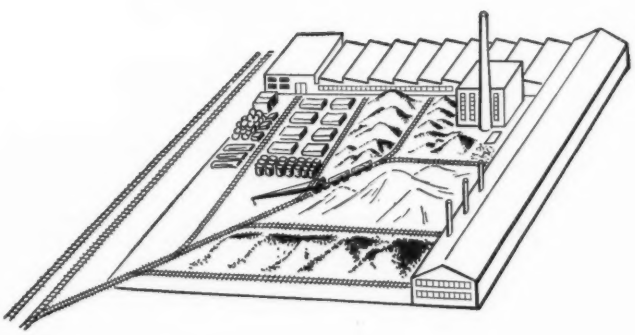
RAILWAY
MAINTENANCE CORP.
PITTSBURGH 30, PA.

"MOLE"
BALLAST CLEANER

McWILLIAMS "MOLE" BALLAST CLEANERS ARE AVAILABLE IN BORDER AND INTERTRACK MODELS.

New Salesman for Rail Service

The new "American" Diesel-Electric Locomotive Crane makes rail-served storage yards and stock piles more economical and convenient than ever before. This efficient all-purpose equipment makes it still more desirable for industrial concerns, large and small, to use the railroads, both for shipping in and shipping out. It is the perfect answer to the private switching problem — powerful, easily controlled, smooth starting, fast moving, sharp turning. It is a most flexible and durable materials-handler — easily changed from hook to bucket to magnet, and supplying current for the magnet. It piles high and wide and works safely inside buildings and out — is smoke and spark-free. Study all *your* storage requirements in the light of this new "streamliner of the storage yards." Individually designed diesel, gasoline and steam models are also available.



AMERICAN

AMERICAN
HOIST & DERRICK CO.
St. Paul 1, Minnesota
CHICAGO NEW YORK SAN FRANCISCO

REVOLVERS LOCOMOTIVE CRANES HOISTS DERRICKS BLOCKS AND SHEAVES CROSBY CLIPS

Now-kill weeds!

easily . . . completely . . . chemically

2-4 DOW WEED KILLER

Check Your Weed Problem

- ✓ **Barnyard, fence rows, ditch-banks**
- ✓ **Highways, railroads, utility lines**
- ✓ **Parks and playgrounds**
- ✓ **Fields, orchards, cut-over land**
- ✓ **Irrigation, drainage ditches, canals**
- ✓ **Estates, lawns, golf courses**
- ✓ **Airports, landing strips**
- ✓ **Pasture and ranch land**
- ✓ **Cemeteries**
- ✓ **Vacant lots, roadsides**

See your dealer or write direct

AGRICULTURAL CHEMICAL DIVISION

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago
St. Louis • Houston • San Francisco • Los Angeles • Seattle

Kill weeds the modern chemical way you have been reading about! Spray 2-4 Dow Weed Killer —to kill weeds easily, completely! 2-4 Dow Weed Killer is more efficient, easier to handle. It kills deep roots—does not sterilize soil or harm grass when used as directed. It's economical. Powder: 4 ounces up to 50-pound drums. Liquid: ½ pint up to 50 gallons.

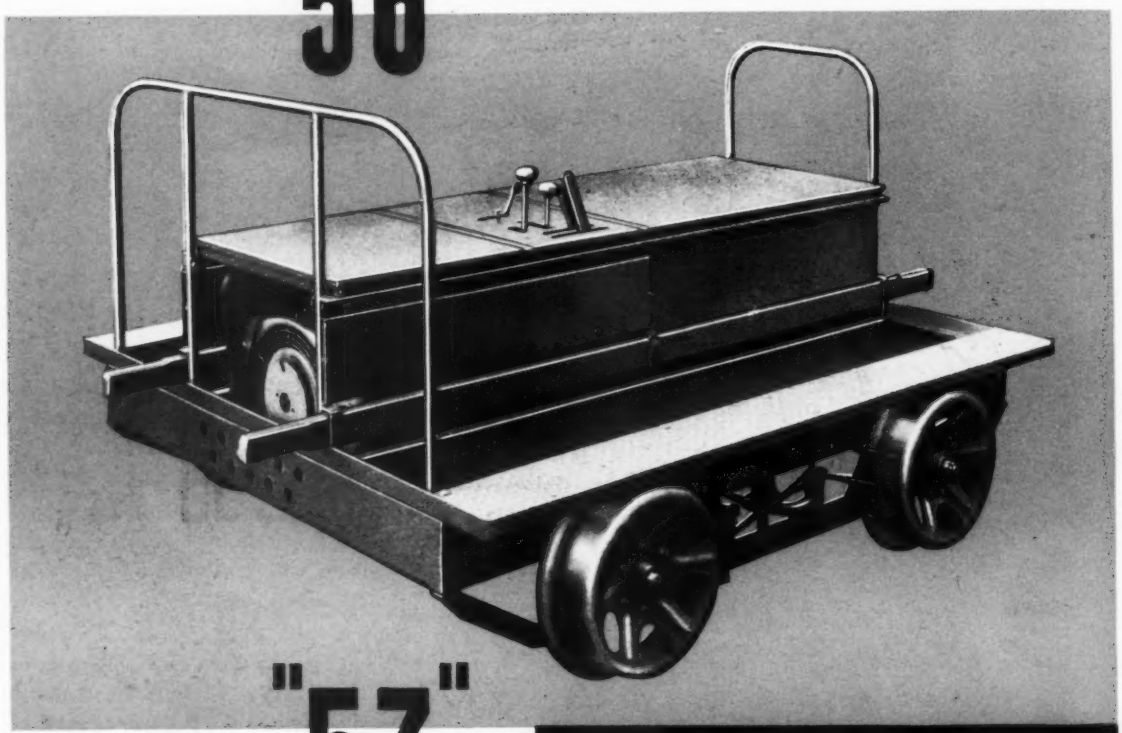
This is the first of a series of weed killers produced by Dow. Selective weed killers for other specific purposes will soon be available. Keep in touch with Dow and you'll kill more weeds!

DOW

CHEMICALS INDISPENSABLE TO INDUSTRY AND AGRICULTURE

PRESENTING THE *New!*

"56"



AND "57"

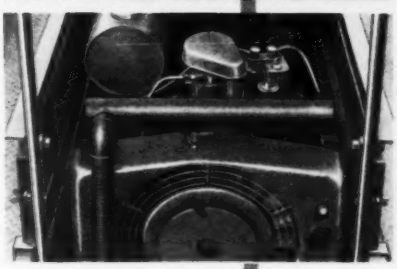
KALAMAZOO
UTILITY CARS

MODERN • • EASY RIDING • • SENSATIONAL PERFORMERS

Two cars . . . each designed for its specific use, yet interchangeable and flexible in operation — the "perfect pair" to team with today's busy maintenance crews.

The "56," for a 6 man crew, is a lightweight section car capable of performing a wide range of work. The "57" is a lightweight inspection car, the perfect teammate to the larger "56." Stronger and lighter; equipped with newly developed, powerful, air-cooled engines and with many other distinctive features, these cars give greater safety and efficiency on the job.

5 POINTS OF SUPERIORITY



1. **NEW MODERN DESIGN** Streamlined design for greater utility and efficient performance. Compact, yet with large compartments for tools and equipment.
2. **INTERCHANGEABLE PARTS** The "56" and "57" have 95% interchangeable parts, such as: engine, transmission, axles, bearings, brakes and wheels, thus lowering inventory costs and facilitating servicing of cars.
3. **LIGHTWEIGHT** New light metals, engine, and other parts combine to make these the "lightest," yet most capable cars on the rails. The "56" weighs 695 lbs., rear lift 105 lbs. The "57" weighs 530 lbs. with rear lift of 95 lbs.
4. **GREATER POWER** Smooth and practically free from vibration, 10 H.P., 4 cycle air-cooled engine has aluminum cylinders with steel sleeves, all gear transmission — two speeds forward and two reverse.
5. **ALL STEEL CONSTRUCTION** Body forming frame of channel steel, rigidly bolted, with rail skids acting as trusses. Rubber cushions, mounted in axle housings, make easy riding.

Kalamazoo's Engineers and Designers have achieved sensational new power — minimum weight — safety — increased efficiency and durability. They have incorporated new developments never found in this type of car. Use of these cars will insure top performance in the strenuous maintenance job ahead. Write for bulletin M 5601.

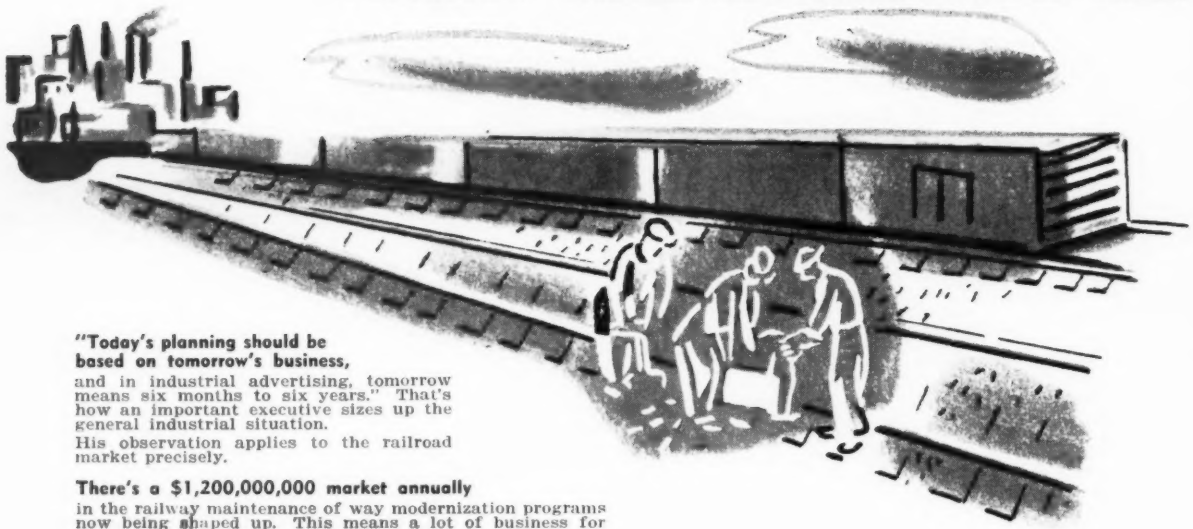
Kalamazoo Manufacturing Company, Kalamazoo 24F, Michigan

KALAMAZOO MEANS SERVICE TO YOU

KALAMAZOO

Railway Maintenance Equipment

"Tomorrow" Means Six Months To Six Years



"Today's planning should be based on tomorrow's business,
and in industrial advertising, tomorrow means six months to six years." That's how an important executive sizes up the general industrial situation.
His observation applies to the railroad market precisely.

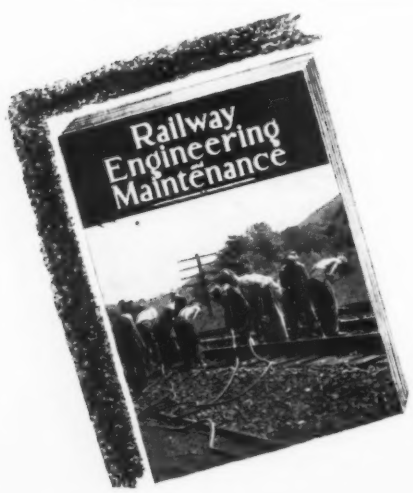
There's a $1,200,000,000 market annually
in the railway maintenance of way modernization programs now being shaped up. This means a lot of business for manufacturers and suppliers tomorrow.

Today—Now—is the time for manufacturers,
whose products the railroads need, to start building tomorrow's railroad business for themselves. Prepare today—through regular and consistent advertising in Railway Engineering and Maintenance.

Railway Engineering and Maintenance gets
your message to those railway executives and supervisors who make the buying decisions for roadway, track, bridge and building, and water service departments. Railway Engineering and Maintenance is effective because it thoroughly penetrates this important group:

These Railway Executives Receive and Read
RAILWAY ENGINEERING & MAINTENANCE

GROUP	READERSHIP	GROUP	READERSHIP
Executives in Chg. Eng'g.	96.6%	Roadmasters	92.0%
Chief Engineers	98.4	Track Supervisors	87.0
Chief Engineers M/W	100.0	General Inspectors	87.5
Engineers M/W	88.5	Supts. Work Equip. and M/W Shops	93.0
Principal Asst. Engrs.	100.0	Engrs. Struct. & Design	98.0
Assistant Engrs.	88.0	Supervisors B & B	94.0
Miscellaneous Engrs.	90.0	Master Carpenters	93.0
Valuation and Office Engrs.	94.0	Supts. Treating Plants	90.0
Distr. & Div. Engrs.	94.0	Water Service Engrs., Supts., Etc.	98.0
Engrs. of Track	80.0		
General Roadmasters	90.0	TOTAL	93.2%



SIMMONS-BOARDMAN
PUBLISHING CORPORATION

ABC — ABP

30 Church Street, New York 7, N.Y.

105 W. Adams St., Chicago 3 — Terminal Tower, Cleveland 13

National Press Building, Washington, D.C. 4 — 300 Montgomery Street, San Francisco 4, Calif.

530 W. 6th St., Los Angeles 14, Calif. — 1038 Henry Bldg., Seattle 1, Wash.

3000 gallons per hour

and no bigger or heavier than a tool kit

WHAT DO YOU WANT IN A PUMP?

PORTABILITY?

-- There's a Gorman-Rupp pump no bigger or heavier than a tool kit that will deliver 3,000 gallons per hour.

RUGGEDNESS?

-- It's not uncommon for a Gorman-Rupp to run 60 days or more without interruption.

CAPACITY?

-- You can get Gorman-Rupp pumps up to ratings of 125,000 gallons per hour.

RELIABILITY?

-- You can't clog a Gorman-Rupp with any muck or solid that will pass the intake.

SIMPLICITY?

-- All Gorman-Rupp pumps are full automatic self-priming. Start the motor and you start the water.

EFFICIENCY?

-- By actual test it has been demonstrated that Gorman-Rupp pumps have not been equalled in pumping capacity for power or size. They are streamlined inside, where streamlining counts.

Ask what you want of a Gorman-Rupp pump – you will get more for your dollar, for a longer period of time.

GORMAN-RUPP PUMPS — ARMY NAVY — UNSURPASSED FOR PUMPING FAST

THE GORMAN-RUPP COMPANY

MANSFIELD • OHIO

Grinding splines of transmission shaft to .001 tolerances in the Oliver "Cletrac" Plant.

We're not tolerant of tolerances!

In fact, we're very exacting! For example, all splines of transmission shafts on Oliver "Cletrac" crawler tractors are ground to a tolerance of .001—insuring true running and easy shifting of gears.

These close tolerances—the precision fits so necessary for smooth, quiet operation—are a primary essential of every operation in the Oliver "Cletrac" plant. And those tolerances are carefully checked by the most modern testing devices to guarantee the maintenance of the outstanding quality that characterizes every Oliver "Cletrac" tractor.

Materials, design and workmanship are all based on one standard—the built-in quality that assures years of dependable, economical service.

Maintenance of that standard enables your Oliver "Cletrac" dealer to offer you the finest in crawler tractors—for your every need.

CLETRAC

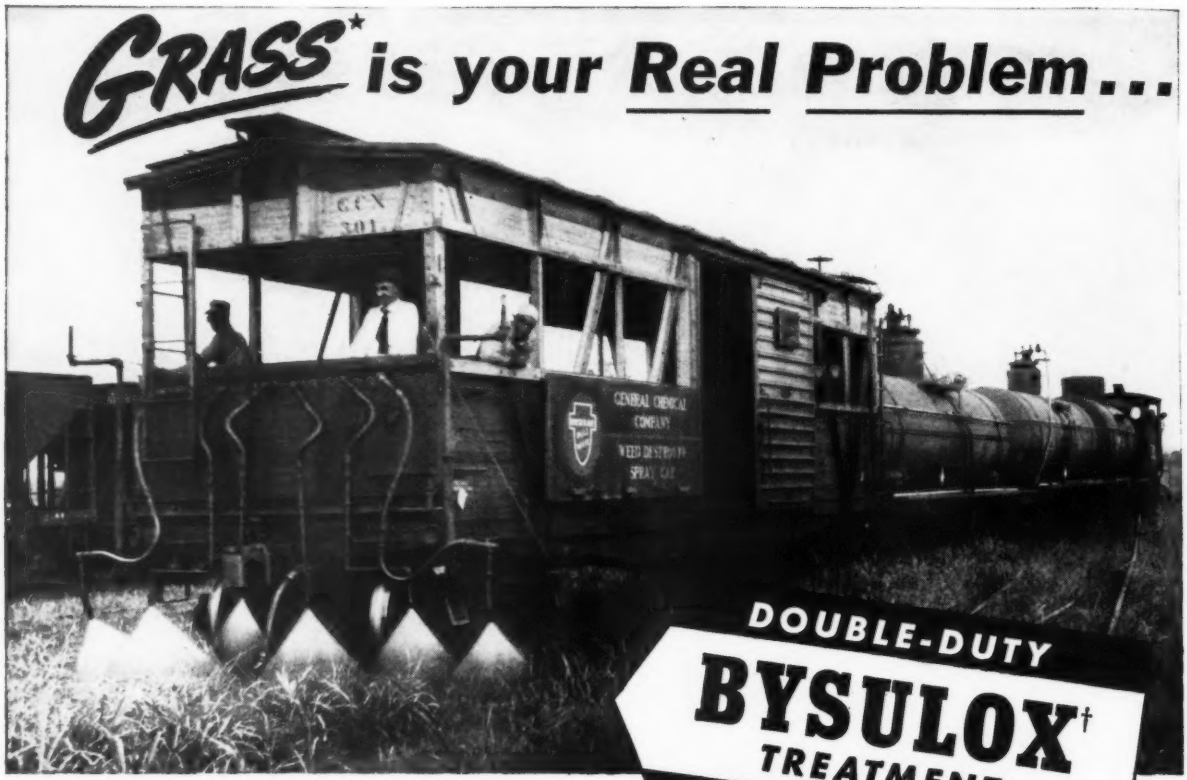
THE OLIVER CORPORATION Cletrac

a product of

The OLIVER Corporation

FIRST
CHOICE
OF RAILROAD MEN
EVERYWHERE
No 117
DUFF-NORTON
15 TONS
DUFF·NORTON
TRACK JACKS
• There is a specific type of safe, easy operating Duff-Norton Track Jack for every track job: Single-Acting Jacks for section gang work; Double-Acting Jacks for extra gang work; Combination Trip and Automatic Lowering Jacks; Side-Lift Jacks; Surfacing and Lining Jacks; Tie Spacers. —Every one is safe, husky and easy to operate. It will pay you to specify Duff-Norton Track Jacks as your standard equipment.
DUFF-NORTON JACKS
DUFF-NORTON TRACK JACKS
ARE DESIGNED, ENGINEERED
AND TESTED TO GIVE YOU LONGER,
MORE EFFICIENT SERVICE

GRASS* is your Real Problem...



DOUBLE-DUTY
BYSULOX†
TREATMENT
CONTROLS IT!

★ *Noxious grass is the real problem in maintaining weed-free track . . . kill it successfully, and weeds automatically fall by the wayside.*

HERE'S HOW: Use double-duty Bysulox treatment! With it *two* powerful chemicals—Bysulox A and Bysulox C—are applied simultaneously in combination with water . . . automatically . . . uniformly. Bysulox A quickly destroys surface fibres, kills tops, and makes leaves and stems porous, absorbent and subject to quick decay. Bysulox C—having a toxic oil base—produces chronic sterility of the soil, waterproofs the treatment against leaching, and suppresses regrowth and seeds.

Properly planned applications of these unique new compounds successfully control noxious grasses such as Horsetail, Quack Grass, Johnson and Bermuda Grass!

OUTSTANDING HAZARD RECORD, TOO! Not one case of livestock poisoning has ever been reported, and thousands of miles of track have been treated with these Bysulox chemical compounds over a three-year period.

"CUSTOM PLANNED" SERVICE: General Chemical Weed Killer Division develops control programs which are individually planned for areas to be treated, basing recommendations on thorough track inspection with regional and divisional statistical cost analyses.

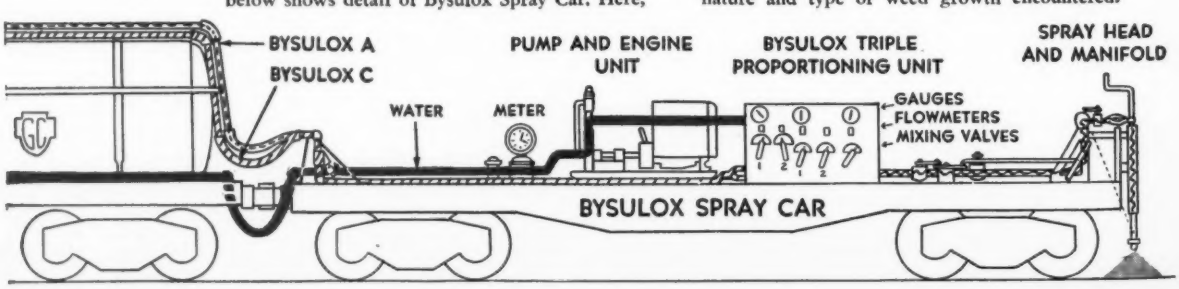
Get the grasses in '46; use Bysulox. For consultation and "custom planned" service, write—

GENERAL CHEMICAL COMPANY
Weed Killer Division
40 RECTOR STREET, NEW YORK 6, N. Y.

†Reg. U. S. Pat. Off.

ADVANCED APPLICATION METHODS

General Chemical's Railroad Service provides the most advanced type of spray train operated by skilled supervisors (See Photo Above). With it, no mixing of chemicals at water towers is necessary; work crews are held to a minimum. Sketch below shows detail of Bysulox Spray Car. Here, Bysulox A and Bysulox C are transferred by air pressure from tank cars, and automatically and continuously mixed with water in a triple proportioning unit. Combined spray may be changed instantly in proportion or quantity, according to nature and type of weed growth encountered.



How to Reduce Rail Cropping Costs

Save the time and expense involved in hauling rails long distances to a central plant for cropping.

The Airco portable rail cropping machine enables you to set up a rail cropping plant at any point along the right of way convenient to the job and to move it quickly to suit changing requirements.

You can even crop rails in the track when necessary. Weighing only 61 pounds, the Airco portable rail cropping machine is easily moved about by one man.

Employing two highly-efficient oxyacetylene flame cutting tips, it will produce as many as 30 cuts per hour, giving a quality surface that requires a minimum of grinding.

For complete information on this modern maintenance machine, mail the coupon for illustrated four page folder. Address Air Reduction, 60 East 42nd St., New York 17, N. Y. In Texas: Magnolia Airco Gas Products Company, Houston 1, Texas.

AIRCO AIR REDUCTION

Offices in All Principal Cities

Costs Come Down Under the Airco Plan

REM

AIR REDUCTION
60 East 42nd Street
New York 17, N. Y.

Please send a copy of the Rail Cropping Machine folder to

Mr. _____

Title _____

Road _____

Address _____

City _____ Zone _____ State _____

No. 207 of a Series

Railway
Engineering and Maintenance
SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: Keeping Our Promise

Dear Readers: March 1, 1946

Have you noticed any change in the appearance of Railway Engineering and Maintenance lately? Discerning as so many of you are, I am certain you have. In fact, some of you have already commented about it.

Yes, the removal of war-time paper restrictions has eliminated our principal "headache" of recent years, and we're well on our way back to normal; in fact, in some respects are outdoing "normal". Beginning with December, 1942, one paper cut after another required that we effect paper savings wherever possible, and to do that without reducing our service to you, we began to cut back where it would hurt least. First, we cut the weight of our paper stock, then margins and trim size. Subsequently, we made further cuts in both of these respects, reduced the size of many illustrations, minimized the number of available copies for binding and office use, and, as a last resort, froze our subscription lists.

Today, all of these measures have been abandoned. As will be evident to you in this issue, if it wasn't in our January and February issues, we're back to our pre-war size, $8\frac{3}{4}$ in. by $11\frac{5}{8}$ in.; we're back to a good weight and quality of paper stock, which permits a materially improved printing job; and we're using more and larger illustrations than ever before. Furthermore, circulation restrictions have been removed, and once again anyone who has a keen interest in railway engineering and maintenance matters can have his own copy through a personal subscription.

When we were necessarily adopting stringent measures during the war to stay within our paper quota, we promised that we would "come back" as quickly as lifted restrictions would permit—and we have kept that promise.

This does not mean that we are satisfied with Maintenance as it is today, because we're not, but we are making the effort, and you can expect a still better publication in the future if it is within our power to make it so.

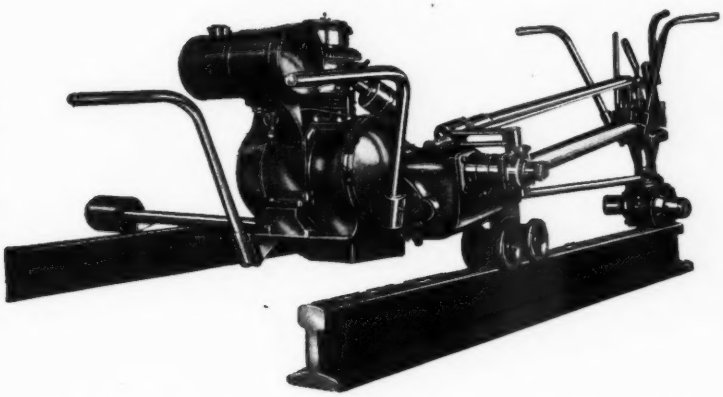
Sincerely,

Neal D. Howard
Editor

MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

Announcing the new

Model B Raco Power Track Wrench



Greater Power

Greater Speed

Vastly Greater Flexibility

Remarkable ease of operation

Model B Raco Power Track Wrench combines the automatic torque control for accurate out of face tightening, with excess power for rapid removal of rusted nuts in rail laying.

The high speed runs new nuts on to within a fraction of a turn, after which a direct quick switch into low puts them up to the Micro-Cutout torque setting.

Chucks operate in unison from one set of controls, each with high and low speeds, both forward and reverse.

Chuck head does not turn. Chucks engage nuts squarely on either side of rail.

At normal engine speed chucks revolve as follows:

High (direct drive)—120 R.P.M.
Low (geared) — 20 R.P.M.

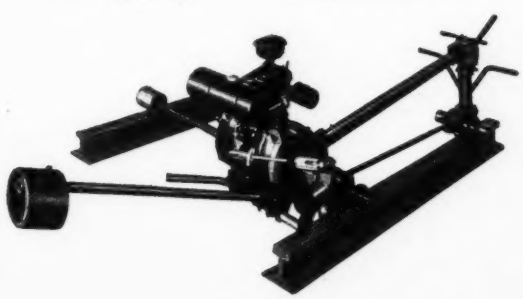
Truck and outboard roller are located so as to provide floating balance for operating head, without the use of balance weight at rear of machine.

Control lever operating in "Z" slot, allows instant shift through neutral to either high or low speed.

Full power lever at operator's left hand. Reverse lever on side of operating head.

Micro Cutout located in cylinder on side of gear housing, with scale at slot under spring clamp. It can be sealed with car seal, if desired.

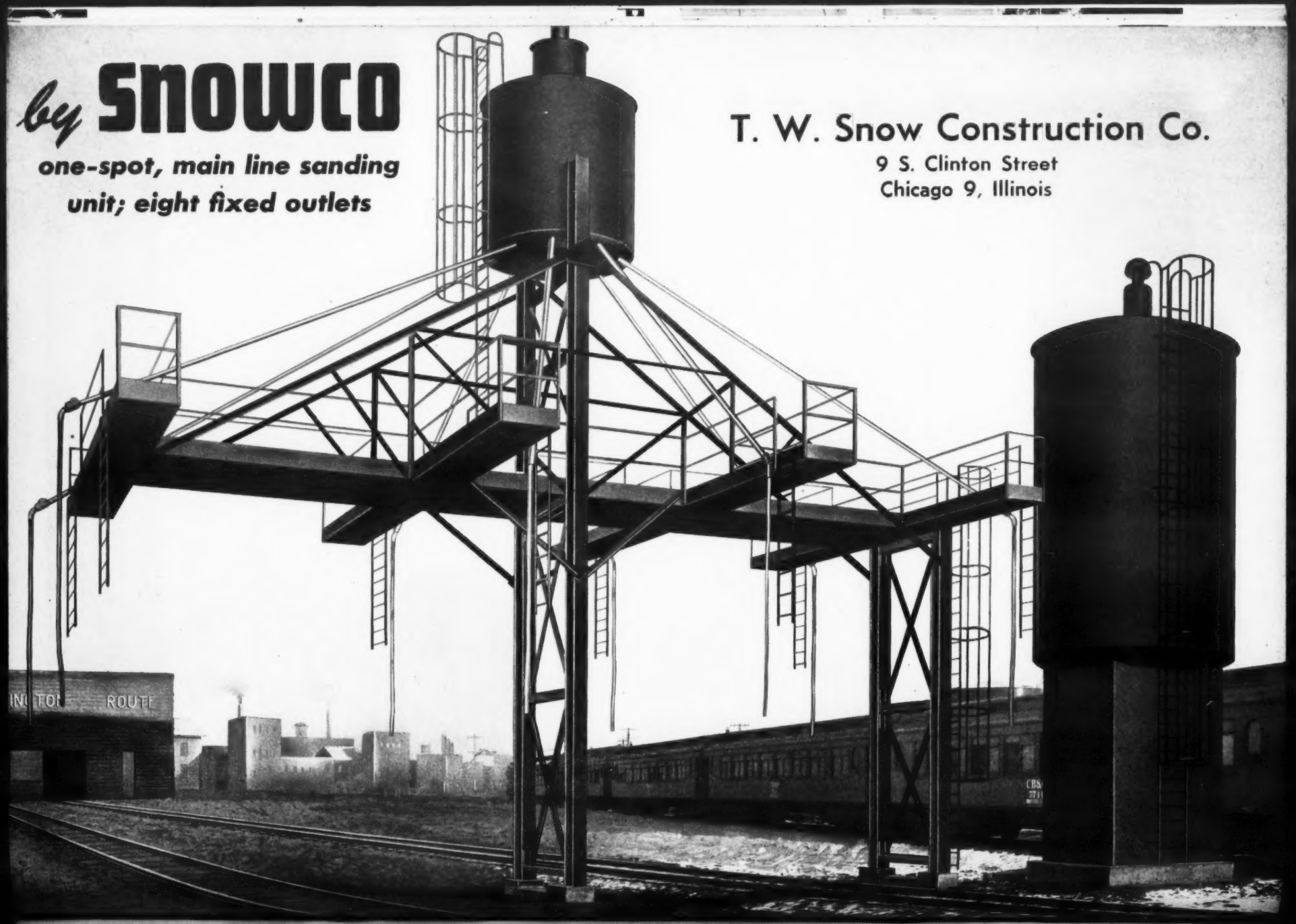
Full power lever operates through Micro Cutout without reference to setting of latter.

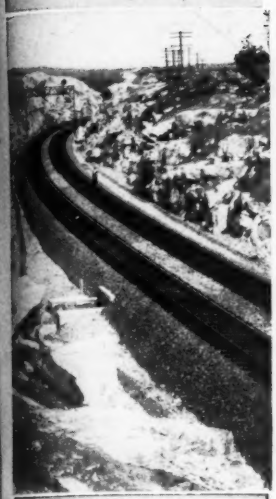


We shall continue to produce the Model A Raco Power Track Wrench for use where excessive power and speed are not required.

RAILROAD ACCESSORIES CORPORATION

CHRYSLER BUILDING • NEW YORK


by SNOWCO
one-spot, main line sanding unit; eight fixed outlets
T. W. Snow Construction Co.
9 S. Clinton Street
Chicago 9, Illinois



Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

MARCH, 1946

Editorials - 275

Public Relations—Deliveries Delayed—Ice Jams—Millions for Equipment—Pipe Lines

$14,000,000 for Work Equipment in 1946 - - - - - - - - - - 278

Survey indicates that the railways propose to purchase approximately 10,000 power machines and tools to aid their programs

Small Rail Gang Gets Machines—Output Soars - - - - - - - 281

An analysis showing how the production per man-hour of a crew on the C. & N.W. was increased as power equipment was added

Work Equipment Big Factor in A.C.L. Track Work - - - - - - - 284

Shows the important role power machines are playing in an extensive rehabilitation program in progress on this road

Need for Work Equipment Increasing - - - - - - - - - - 292

Contributors to a symposium discuss the requirements for power machines and the problems involved in their use and upkeep

Machines Speed Bridge Rebuilding Job on B. & M. - - - - - - 296

F. R. Spofford describes how a structure at Boston, burned out for the second time in four years, was reconstructed

Equipment Repair Shop and System on N.P. - - - - - - - - 300

Describes organization developed for inspecting and maintaining machines, including new modern facilities at Livingston, Mont.

C. & O. Track Awards - - - - - - - - - - - - - - - - - 305

Gives results of inspections made last year, including names of the track supervisors who were awarded cash prizes

A.R.E.A. to Hold First Post-War Meeting - - - - - - - - - - 306

Presents program and other details of coming session, and letter from A. A. Miller, president, inviting our readers to attend

Products of Manufacturers - - - - - - - - - - - - - - - 308

What's the Answer? - - - - - - - - - - - - - - - - - - 322

Placing Riprap by Hand
From Canted to Flat Tie Plates
Information on Foundations
Ventilating Attics
Heating Concrete Aggregates
Added Inspection for Rail
Harding-Riding Frogs
Solids in Boiler Waters

News of the month - - - - - - - - - - - - - - - - - - 329

Published on the first day of each month by the

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 West Adams St., Chicago 3

NEW YORK 7,
30 Church Street

CLEVELAND 13,
Terminal Tower

WASHINGTON, D.C., 4,
1081 National Press Bldg.

SEATTLE 1,
1033 Henry Bldg.

SAN FRANCISCO 4,
300 Montgomery St.

LOS ANGELES 14,
530 West 6th St.

DALLAS 4,
4518 Roland Ave.

Samuel O. Dunn, *Chairman of the Board*; Henry Lee, *President*; Roy V. Wright, *Vice-President* and *Secretary*; Frederick H. Thompson, *Vice-President*; F. C. Koch, *Vice-President*; Robert E. Thayer, *Vice-President*; J. G. Lyne, *Vice-President*; H. E. McCandless, *Vice-President*; S. Wayne Hickey, *Vice-President*; John T. DeMott, *Treasurer*.

Subscription price in the United States and Possessions and Canada, 1 year $2, 3 years $3; foreign countries, 1 year $3, 2 years $5. Single copies, 35 cents each. Address H. E. McCandless, Circulation Manager, 30 Church Street, New York 7, N.Y.

Member of the Associated Business Papers (A.B.P.) and of the Audit Bureau of Circulations (A.B.C.)

PRINTED IN U.S.A.

NEAL D. HOWARD
Editor

MERWIN H. DICK
Managing Editor

JOHN S. VREELAND
Eastern Editor

GEORGE E. BOYD
Associate Editor

CHARLES C. ROBINSON
Associate Editor

S. WAYNE HICKEY
Business Manager

YOU CAN HAVE AN INDEX

Copies of the index for 1945 will be issued to subscribers asking for them. If you desire a copy of the index please send in the coupon below.

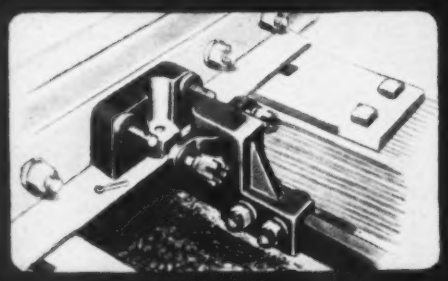
Circulation Manager
Railway Engineering and Maintenance
30 Church St., New York 7, N. Y.

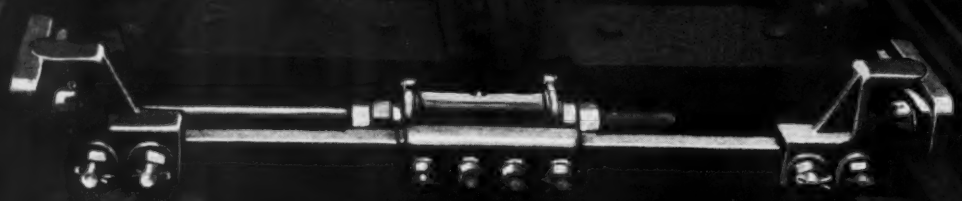
Please send index to address below

Name .....

RACOR
TRADE MARK REGISTERED

Free Swiveling VERTICAL RODS





For greatest strength and easier switch operation

The use of Racor's patented Switch Clips WITH VERTICAL RODS eliminate the damaging effects of switch rod strain and flexing under load or throw — reduce customary replacement of parts necessary where horizontal rods are used — permit easy and economical switch operation and assure maximum resistance against rolling points.

Racor Type "M" No. 1 VERTICAL ROD and Type "MF" VERTICAL FRONT ROD are positive protection against switch failures.

PIONEERS IN THE DEVELOPMENT AND MANUFACTURE OF

DEPTH HARDENED CROSSINGS	SAMSON SWITCH POINTS
AUTOMATIC SWITCH STANDS	VERTICAL SWITCH RODS
MANGANESE STEEL GUARD RAIL	REVERSIBLE MANGANESE STEEL CROSSINGS

World's most complete line of Track Specialties

Write Today for your copy of our new and complete TRACK SPECIALTIES CATALOG

AMERICAN Brake Shoe COMPANY

RAMAPO AJAX DIVISION
AMERICAN BRAKE SHOE COMPANY
332 So. Michigan Avenue, Chicago 4, Illinois

Ramapo's greater experience and facilities are ready to serve you.

Railway Engineering and Maintenance

Public Relations—

A Job for Everyone on the Railroads

One of the biggest jobs that confront the railways—and a fundamental job it is—is to sell themselves more completely to the public, and to keep themselves sold. In no other way can they hope to survive the onslaught of inequitable regulation, unfair subsidies to others, excessive taxation, and the intensive competition with which they are certain to be confronted. To a greater extent than most other industries, the railways must have general public good will to hold their own and to prosper. This requires not alone that they render a service that will be acceptable to the public, but that the public understands their problems and views these problems sympathetically.

As a result of their outstanding contribution to the war effort during recent years, there is, unmistakably, a large segment of the public that views the railroads as an efficient, enterprising, competently-managed and essential form of transportation. But it would be a serious mistake for the railroads to close their eyes to the fact that there is another large segment of the public that thinks they are obsolete, outmoded, non-progressive and inefficient. Hence, there is a public relations job for them to do—that must be done—both to uphold and expand that good will established with the one segment of the public, and, at the same time, to break down and dispel the incorrect attitude, if not ill will, on the part of the other segment. Whose job is this?

Unquestionably, heavy responsibility for doing this job lies with the Association of American Railroads, representing the railroads, as a whole. Equally heavy responsibility rests with the managements of individual roads, and especially their public relations officers, using every effective means at their disposal, including the public press, the radio and the movies—and on a scale not fully comprehended as yet.

But if responsibility in this important matter ends here, this subject would not be discussed in these pages. The fact is, that this job is in part the responsibility of every supervisory officer on the railways, from section foreman up, and that unless they accept their share of this responsibility and discharge it intelligently and diligently, the efforts of the railroads through the A.A.R., through their managements individually, and through their public relations officers, will be of little avail.

In what ways have supervisory officers, and, more particularly, those in the engineering and maintenance departments, a share in this responsibility? Only a suggestion of an answer can be offered here, but it definitely includes that they be boosters of their industry; that they fortify themselves with the necessary facts, and in their contacts with the public not only "sell" the railroads as such, but defend them against unjust criticism and attacks; that they maintain their properties so that every contact of the public with the railways, whether on trains, in passenger stations, or elsewhere, will be favorable; and that they, through leadership, knowledge, and an understanding and sympathetic approach, build good will and a high state of morale among the employees under their immediate direction.

On the unquestioned truth that public good will must have its basis in employee good will—that is, good will within the industry—more attention must be given this factor than ever before, and in this every supervisory officer has a definite responsibility and can make a substantial contribution, even though he may never come in contact with the public in the discharge of his routine duties. All this is vital to the railroads. More than that, it is vital to every supervisory officer and other employee, because it is axiomatic that only as the railroads are made secure and continue to prosper, through providing superior service and enhanced public good will, can those employed by the railways hope to have security and prosperity themselves.

Deliveries Delayed—

But Much Improved Equipment Coming

SETTLEMENT of the steel strike on February 18, which automatically settled strikes in many other related plants, was almost as vital to the railway industry as it was to the steel industry itself, and it brought relief, almost akin to rejoicing, to those in charge of roadway and structures maintenance on the railways.

Until that settlement, the outlook for an early start on the heavy 1946 programs of the maintenance forces was dark indeed. Not only had deliveries of their basic steel requirements, including rail, been cut off, but the door was practically shut to them for badly needed power tools and machines from manufacturers who were either involved in the strike, or whose stocks of steel for manufacturing purposes were so low as to curtail production and threaten ultimate shutdown. To many maintenance officers with a crying need for power tools and machines of all kinds to carry out essential work more speedily, more effectively, and more economically, 1946 bid fair to be another "war year" of serious handicaps, unless peace in the steel industry came, and came quickly.

Less than a month ago, before the settlement came, a large number of representative equipment builders were asked to outline the prospects for making deliveries to the railways. In substance, their replies were almost invariably: "Your guess is as good as mine." With them everything depended upon restoration of peace within the steel industry. Today, with steel again flowing from the furnaces, most of these same builders are far more optimistic, and see their production and deliveries speeded up materially.

But damage was done—irreparable damage. In most cases the month-long strike, coming as it did in the late winter months, dammed up production all along the line immediately ahead of the opening of the heavy working season of the maintenance forces, demoralizing a situation that would have been none too good if there had been no strike. As a result, the maintenance forces must start their new season's work severely handicapped in many respects, and especially because of insufficient new equipment to replace inefficient and worn out units. Once more they must tighten their belts and, for the time being, make the most of what they have. They did it before—they can do it again. This time, fortunately, they can look for early relief, and a relief, when it comes, that will bring with it a large amount of equipment superior in every way to that available during the pre-war and war years.

Of 25 builders answering a question in this regard, all but two report that research, developments and improved manufacturing processes during the war will bring marked improvement in their post-war models—improvements in the way of simplified design, improved materials, increased portability, greater efficiency, lighter weight, more power, better controls, and increased safety of operation. Of these same 25 builders questioned, all but five likewise report entirely new machines completed or in the process of development, some of which invade the field of presently unmechanized operations, while others promise increased production and efficiency, with greater flexibility and longer service life than types heretofore available.

In this respect—and in the long run it is by far the most important respect—the work equipment picture is bright. In the benefits to be derived from this new influx of improved equipment, present temporary inconveniences and difficulties will disappear. It remains for maintenance men to see present difficulties through; to urge builders to their greatest diligence in consummating those developments now under way, and to speed deliveries; and then for them, with fully open minds, to avail themselves of these developments at the earliest possible date, to the fullest extent that can be justified.

Ice Jams—

Occur Most Frequently at This Season

IN many localities ice jams are the bane of the bridgeman's existence at this season of the year. They follow no pattern, except that of destruction if they are not broken up before they can marshal their full force against the endangered structures. The stream that gave no trouble last year may be the point of most critical danger this year, while the one that caused the bitterest fight may have little ice in it now, or the same amount of ice may go out quietly without threatening the safety of the bridge. Another vagary of this type of trouble is that a jam may form below the bridge and back up through the structure.

Yet an ice jam, while it may form quickly once the ice is in motion, seldom comes unexpectedly, although this does happen at times. Usually, however, the maintenance forces have ample time to prepare for them and, sometimes, to break them up before they are forced downstream to the railway crossing of the waterway, thus allowing the component ice cakes to pass through the structure without stoppage. When a jam forms downstream and backs up through a bridge, considerable caution must be exercised in breaking it up to avoid starting a flow of ice that cannot be controlled.

In the event of a backed-up jam, the most effective treatment will be to plant explosives at intervals, that must be chosen in the light of the particular conditions surrounding the jam, both below and above the bridge. One should make certain that each of these charges are powerful enough to tear the ice apart when fired, rather than to disturb it only enough to start it moving en masse, and thus pack tighter. This operation should be placed in the hands of an expert in the use of explosives and the charges should be fired successively, beginning with the one farthest downstream, working upstream as the ice runs out from each of the previous explosions.

There are many ways of breaking up ice jams, too many, in fact, to catalog here. However, explosives are the main reliance for this purpose and, if used with judgment, the most effective. Quite frequently, the best results from their use are not obtained because of the almost universal tendency to fire charges that are too light to accomplish the purpose for which they are employed. No matter how tightly the ice seems to be packed, it possesses little rigidity as a mass, and exerts a cushioning effect on the force of the explosive, unless the charge is heavy enough to tear it apart. In other words, a light charge may cause the ice to shift and start moving without breaking it apart, where a heavy charge will start the disintegrated parts to move out quietly with the current.

Where heavy ice has formed in a stream to such an extent that it may endanger a bridge, an effort should be made to break it up and get rid of as much of it as possible for some distance both above and below the structure, to provide a clear channel for the ice as it rides down on the flood waters. Later, when the water begins to rise, every effort should be made to prevent the stoppage of any of the cakes and the formation of a jam where it might cause trouble. The greater the amount of ice that can be passed through the bridge beforehand, the less the likelihood of trouble when the flood is at or near its crest.

Millions for Equipment—

But Pennies for Its Maintenance and Repair

RAILWAY officers may well ask themselves whether their facilities for the maintenance and repair of power machines and power tools are keeping pace with the increased volume, use and importance of such equipment. On most roads the shops for effecting this maintenance and repair are little changed from those developed originally for the maintenance of motor cars and a few pieces of heavier equipment. The storage of equipment when not in use or while awaiting repairs is another feature of equipment maintenance that is often neglected. When expensive machines are left in the open, exposed to the weather, their deterioration from exposure and other damage is usually as great, or greater, than when in use.

There has been a remarkable increase in the use of maintenance of way work equipment within the last decade. During the last nine years, the purchase of work equipment for use by the maintenance forces has shown an almost steady increase, from 3,310 units in 1937, to 11,733 units in 1945, or a total of 59,590 units in the nine-year period, at a cost of more than $75,000,000. Not all of these machines, to be sure, were purchased as additions to the equipment already in service, as some of them replaced similar obsolete or worn out units. But who will contend that the repair organizations and work equipment shop facilities on most roads have kept pace with the large expansion in equipment which is readily evident?

Railway work equipment is short lived at best because of the work it is called upon to perform and the conditions under which it is operated. Furthermore, such equipment is not always in the hands of skilled operators, which not only tends to shorten its useful life, but which also adds to the requirements for adequate repair facilities.

Most maintenance of way equipment repair shops, like Topsy, have just "growed," and where such shops are equipped with machine tools, these usually consist largely of obsolete or worn-out machines discarded by the mechanical department. Furthermore, the housing afforded is usually inadequate and often consists of abandoned buildings, wholly unsuited to the purpose.

In a few cases the necessity for adequate facilities and tools has been recognized. An outstanding example in this regard is seen in the new maintenance of way work equipment repair shop on the Northern Pacific at Livingston, Mont., which is described in this issue. On most roads, however, such facilities are inadequate, with the result that the full efficiency of an increasing number of valuable, and almost indispensable adjuncts to maintenance of way work, cannot hope to be obtained.

Unquestionably, that this can be said is due in part to the low earnings of the railways during the depression years, when expenditures for new facilities were cut to a minimum on most roads, and in part to the material shortages of the recent war years, when all except essential building construction was restricted. However, improved conditions now obtain both as to earnings and materials, and on those roads where present equipment repair shops are inadequate or are poorly equipped with proper machines and tools, maintenance officers should make a serious effort to take advantage of the improved conditions, and seek authority for what they know is needed to insure the maximum efficiency and service life from their investment in work equipment.

Pipe Lines—

Cleaning Will Pay Unexpected Dividends

WHAT is the condition of your pipe lines? It is evident from the experience of a number of railroads that the original carrying capacity of many pipe lines has been greatly reduced through age and incrustation. Faced with the alternative of constructing new lines or of restoring existing ones by cleaning, a number of railroads have followed extensive programs of water-main cleaning with excellent results. One road has cleaned almost 100,000 lin. ft., or approximately 18 miles, of pipe during the last three years.

As the schedules of passenger and freight trains have been shortened, the time required for delivering water to locomotives has become of increasing importance in maintaining these schedules. In a number of cases the carrying capacity of pipe lines serving water columns had been reduced by incrustation to such an extent that the delivery of water to locomotives through 12-in. pipe lines was only a little more than 800 gal. per min. After cleaning, the delivery was increased to 2,500 gal. per min., decreasing the time required to take 10,000 gal. of water to 4 min., compared with 10 and 12 min. before.

It is estimated that there are something like 30,000 miles of pipe lines in service on the American railroads, 20,000 miles of which consist of underground pipe, largely cast iron, and that the annual normal construction of new lines and replacements of old lines in water service amount to approximately 1,700 miles. How much of the construction of new pipe lines can be eliminated through a comprehensive program of pipe cleaning is problematical. However, the fact remains that many existing pipe lines, particularly the older ones and those carrying treated water, are incrusted to the extent that power costs for pumping are increased unreasonably; trains are delayed because of the time required in taking water, and actual water shortages are experienced.

Conditions found in existing pipe lines indicate that this important feature of railway water service has not been given the consideration it deserves. Tests and examination of pipe lines now in service will undoubtedly disclose conditions that should not be tolerated from the standpoint of either expense or efficient operation.

$14,000,000

Equipment Budgets for 1946 Call for the Purchase of 709 Units to Be Employed in Laying Rail

WHILE in many of its phases the situation with respect to railway maintenance differs greatly from that of a year ago, that phase which relates to the procurement of materials and the availability of labor remains much the same. In other words, with a backlog of deferred maintenance that is greater than the oldest maintenance officer now in service can remember, labor to overcome any sizable part of this deficit is still unavailable to the railways, and many materials are scarce.

The Only Solution

This is the situation that now confronts maintenance officers, for although there has been considerable easing of the general labor shortage since hostilities ceased, this has been more than offset on the railways by the return of Mexican laborers to their own country and the ban on further importations. In the face of these conditions, the only solution that maintenance officers can see to the problem of much work and little labor with which to perform it, is to continue the intensive use of work equipment.

Maintenance officers received a great deal of preliminary experience during the depression years with respect to meeting shortages in labor through the use of power machines and power tools. Through this experience they learned that, while there is no complete substitute for man-power in maintenance, power machines and power tools can be employed to offset in considerable part a lack of man-power. This fact was driven home still more forcibly during the war years that followed, when the railways suffered from an acute labor shortage.

Now that the critical period of war transportation and war-time maintenance of railway facilities is past, and they have an opportunity to take stock of how they stand, maintenance officers are finding that they are still confronted with as much, if not more, work as at any time in the past. This includes not only the deferred maintenance that must be wiped out, but the necessity for building new reserves into both the track and other structures, and the equally important necessity for keeping them to a high standard to insure that they will constantly be in condition to meet competition from other forms of transportation. At the same time, as a result of their experiences, maintenance officers have come to realize fully that unless they mechanize their forces to the limit, they will be unable to maintain their track and structures to the standards that will be required to handle the heavy post-war traffic in prospect, with the degree of satisfaction that will be demanded.

To make the analysis upon which this article is based, a selected group of roads was asked what types and what number of power machines and tools they expect to purchase in 1946. Replies were received from 34 roads, of which 29, representing more than 110,000 miles of lines, said that they expect to purchase work equipment during the year. The remaining five replied that owing to the unsettled industrial situation they have made no budget arrangements for either their maintenance activities or their purchases of work equipment.

Another Big Year

Of the 29 roads mentioned, two said that their purchases will be approximately the same as in 1945; two gave the amount of money they expect to expend for work equipment, but did not list the number or types of units they expect to buy; and several others specified the number of units in their current budgets, but said that they still have a number of machines ordered last year, that have not yet been delivered, and that these units are in addition to those in the current budget.

On the basis of the foregoing information, it is estimated that at present the railways are planning to purchase approximately 8,000 units of the heavier types in 1946, including those that will be carried over on undelivered orders. In arriving at this figure, the actual number of units included in the budgets of the roads participating in this study has been extended to include all roads in the United States and Canada. The same method has been followed in estimating the number of units of individual types which will be discussed later.

Always Buy More

It should be kept clearly in mind, however, that the foregoing figure does not include any of the small, portable, power-operated hand tools, used principally in bridge and building work, of which a substantial number are purchased every year, although they seldom appear in the budgets for work equipment. Neither does the figure given include many portable tools, other than tie tampers, used by the track forces, nor certain

for Work Equipment in 1946

With Little Prospect for Improvement in the Labor Situation, the Railways Propose to Purchase Approximately 10,000 Power Machines and Tools to Aid Their Programs

other types that are seldom included in the budgets for power machines, but which are purchased in considerable number as the year advances.

On the basis of the purchases of these smaller types that have been made in recent years, and particularly of those that were made in 1944 and 1945, it is safe to assume that not less than 1,500 such units will be purchased during 1946. Adding these to the units about which the information given is more definite, the total number of units which the railways plan at this time to purchase in 1946 is increased to 9,500, for which they will spend approximately $14,000,000.

Another feature of work equipment purchases that should be kept in mind is that the budget estimates invariably fall short of actual purchases. In fact, even after consideration is given to those items that seldom appear in the budgets, but that are purchased during the year, the actual purchases normally exceed the budget by from 25 to 50 per cent, so that the purchases for 1946 may well be 10,000 units.

Record of Value

Obviously, a record of the total purchases of work equipment year by year is of value and interest to every maintenance of way officer, because it becomes not only a measure of the expanding use of this equipment and of the extent to which it is being employed in railway maintenance, but such a record also discloses the current trends in the use of power machines and tools. To permit an analysis to be made of the trends for the year, the chief engineers and engineers maintenance of way who were solicited for information concerning their plans for the year, were also asked to give detailed information with respect to the number of units of each type of equipment that they have included in their budgets.

Will Get Many Types

In response to this request, 87 types of power equipment and accessories were mentioned, more than for any previous year, except in the budgets for 1945. This number includes none of the small tools used in bridge and building work, except saws, wood borers and small power wrenches, so that the actual purchases will represent a much greater number of types. As the lists were given, however, they cover a wide range with respect to both size and types for an equally wide range of maintenance operations. They include a large amount of heavy grading equipment, such as power shovels, draglines, carryalls, scrapers, tractors and auxiliary attachments, locomotive cranes, lighter cranes and excavation buckets; a record amount of almost every type of machine incidental to laying rail and for its later maintenance; for ballasting and renewing ties; pile-driving equipment; snow-fighting equipment; jackhammers, paving breakers, impact and other power wrenches, rail saws, wood saws and other tools.

The foregoing list covers only a few of the 87 types that were mentioned specifically, for the complete

To Carry Out the Extensive Surfacing Programs in Prospect the Railroads Plan to Purchase Many Tie Tamping Outfits as Well as Other Machines Used in This Work

list includes also concrete mixers, equipment for cleaning ballast, for providing drainage, for controlling weeds, for maintaining bridges and buildings, for cleaning and painting structures, for transporting men and materials, and for practically every other maintenance operation for which power machines and tools have been made available.

Large Deficit in Rail

During the war years, the railways were dependent upon the War Production Board for allocations of practically all of the materials they needed for both construction and maintenance. It is now a matter of history that under this system, necessary as it seemed to be, the railways were forced to accumulate a huge deficit in the amount of new rail they needed and, in many cases, needed desperately. As a result of this accumulated deficit and the passing of war control over materials, the railways plan to lay a larger amount of new rail in 1946 than in any year since the beginning of the depression, 17 years ago, subject only to the availability of the rail.

In preparation for laying this rail, despite the large number of such machines purchased during each of the last five years, the budgets for 1946 call for the purchase of 709 units to be employed in laying rail, some of which will be used later in connection with rail maintenance. While this is somewhat less than the number budgeted for 1945, it is well above the number normally included in the budgets. These machines include tie adzers, bolt tighteners, spike pullers, spike drivers, rail cranes, rail-laying machines, rail and bonding drills, and surface and cross grinders, as well as portable hand grinders.

Much Ballasting

As contemplated in the budgets, the amount of ballast to be applied is larger than for any of the war years; in fact, more than for any year since 1930. In addition, with only a few exceptions, the plans for the year call for a relatively large increase in out-of-face surfacing without the application of ballast, except as may be required to fill out the ballast section to standard.

As an indication of the volume of surfacing in prospect, both with and without additional ballast, the current budgets provide for 385 tie tamping outfits, ranging from 4 to 12 tools, of both the electric and pneumatic types, and 326 unit tampers. In addition, 182 other units, including cribbing machines, power jacks, power ballasters and miscellaneous machines, are included in the budgets for the year. This makes a total of 893 units designed for use in surfacing track, besides which a considerable number of individual tamping tools will be purchased for replacing similar worn out tools.

Must Destroy Weeds

Maintenance officers have come to look upon weed destruction as not only desirable, but as a prime necessity, placing the destruction of weeds in the same category as drainage with respect to its importance if high standards of track and roadbed are to be maintained. Neglect to keep the roadbed and ballast clear of weeds results in defective drainage and increased expenditures of labor to maintain line and surface, while it requires more frequent cleaning and applications of ballast to overcome clogged drainage.

Furthermore, uncontrolled vegetation on the right of way not only presents an undesirable appearance, but creates a hazard of fires that may destroy structures and thereby delay or endanger traffic. Such fires are also prone to extend to adjacent property and destroy crops and farm buildings. To avoid these risks, the budgets for 1946 contain provision for the purchase of 223 weed-destroying units, including weed burners and on and-off track mowing machines of various designs. In addition a number of roads expect to make extensive use of chemical weed destroyers.

Earth-Moving Equipment

An important trend that has been gathering force for several years and which was accelerated to a surprising extent by war demands for a stable roadbed, is the utilization of earth-moving equipment, of which 312 units were included in the budgets. While this is fewer units than were in the budgets for last year, it is more than the normal number for each of the years preceding 1945. These units include power shovels, draglines, cranes fitted with excavating buckets, tractors and earth-moving attachments, carryalls, graders, scrapers, road rollers, and other similar types of equipment.

As has been explained, no close estimate of the number of small, readily-portable, power-operated hand tools to be purchased can be obtained from the budget figures as given, since many of them make no reference to this class of tools, while others include only a few or say "miscellaneous small tools," or so many "sets of bridge and building tools." For this reason, any estimate for these tools must be based largely on previous purchases rather than on specific information gleaned from the current budgets. However, this year more roads than usual reported that they expect to buy such tools. On this basis it is safe to predict that the purchases of this class of equipment will amount to about 1,500 units, the same as were bought last year. This conclusion is strengthened by the fact that more than 200 power plants, that is, air compressors and electric generators, are included in the budgets, in addition to those included in the tie tamping, welding and paint-spraying outfits that are incorporated in the budgets for 1946. This is approximately the same number purchased last year, which was the record for extra power units.

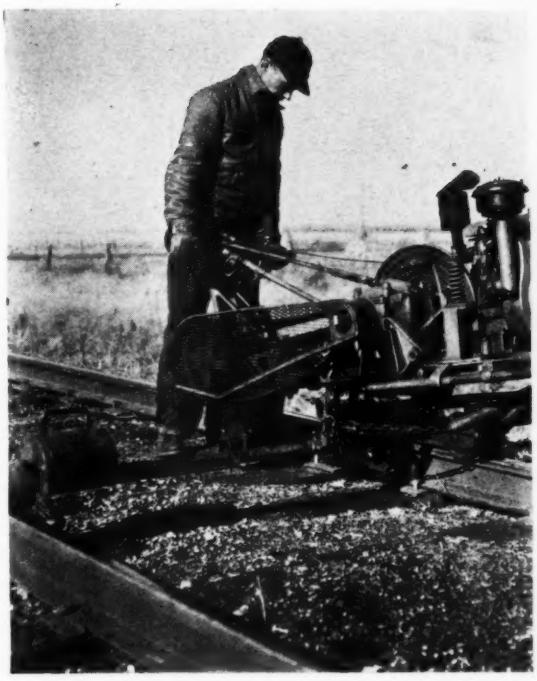
What Are the Prospects?

Will the railways be able to obtain as many as 10,000 units of equipment this year, particularly in view of the unsettled conditions in the industrial field? While it is obvious that no one can foresee the length to which the present strike fever will go, the situation seems to be clarifying to a considerable degree. If the present unrest becomes more settled, and especially with the resumption of steel production, there seems to be no reason why manufacturers of work equipment cannot fulfill the requirements of the railways. They went even further in 1945 than the demands of this year's budgets, and did so under more adverse conditions than they are likely to encounter now.

Putting it still another way, will the railways be able to secure the material and labor that will enable them to do the amount of work planned to catch up on deferred maintenance? It is hardly probable that, with the curtailment that steel production has already suffered, they will be able to obtain as much rail as they had planned to lay. But there is little likelihood that any considerable number of units designed for laying rail will be withdrawn from the budgets, since practically all of them are needed whether the overall rail program is as large as hoped for or not. On the other hand, practically none of the other classes of machines will be affected to any extent, even those for surfacing, for they too are badly needed.

This whole question, therefore, resolves itself into the ability of the manufacturers to meet the requirements of the railways for materials and equipment. The belief in best-informed quarters is that they will be able to do so to a surprising extent.

The Power Track Wrench (Below) and the Adzing Machine (Right) Were the First Two Units of Equipment Added to the Gang



The possibilities in mechanizing small rail-laying gangs, long held in some quarters as unsuited to mechanization, are demonstrated clearly by the experience of such a gang on the Chicago & North Western, which, using four power units, increased its output per man-hour by 250 per cent, compared with that obtained when all operations were performed manually. This article describes in detail the changes brought about in the organization and output of the gang as the machines were added.

Small Rail Gang Gets Machines—

Output Soars

HOW much can the output of a small rail-laying gang be increased by the use of the various types of power machines commonly used by large rail-laying gangs? If the experience of a single gang of 18 to 22 men on a limited amount of work can be considered representative, the answer to this question is provided by the performance of such a gang engaged in laying rail on a branch line of the Chicago & North Western. The experience of this gang is revealing because, through a rather unusual combination of circumstances applying to a particular rail-renewal job carried out in 1945, the gang first worked for a time without the aid of any power equipment, after which, in successive stages, four power machines were added, namely, an adzer, a nut runner, a spike puller and a spike driver.

Performance figures provided by this "case history" of mechanization show a phenomenal increase in output per man-hour following the addition of the various units of equipment. For instance, during the period when all the operations were performed manually, the maximum output of the gang, based on a single day's operations, amounted to 4 lin. ft. of rail laid per man-hour actually spent on constructive work. When the adzer and nut runner were added to the organization the maximum amount of rail laid for any day increased sharply to 8.62 lin. ft. per man-hour, or more than double the previous output. When all four of the machines had been placed in use the output increased further to a maximum of 14.25 lin. ft. of rail laid per man-hour, or more than 3½ times the amount laid when no machines were used.

It should be mentioned that the foregoing figures cover all the operations involved in actually laying the rail, from the removal of the bolts to the piling of the released material, excluding only the time lost in getting to and from the job and in closing the track for trains. It is also important to emphasize the fact that the primary purpose of this article is to show the extent to which the per-

The Spike-Puller (Above) Was the Third Machine Added to the Gang and a Day Later the Spike Driver (Right) Became Available to the Organization

formance of a gang can be enhanced with the aid of power machines, and not necessarily to present an outstanding or ideal example of mechanization. This point is made particularly in view of the fact that, as explained later, the circumstances were such that it was not feasible to equip the gang with a rail crane. Ordinarily, all rail-laying gangs on the C. & N. W. are fully mechanized, the major types of power equipment supplied including cranes, spike pullers, adzers, and bolt tighteners.

The particular rail-laying operation under consideration took place on what is known as the Freeport line, a single-track branch extending from West Chicago, Ill., to Freeport, 91 miles. The rail on 10.8 miles of this line was scheduled for renewal in 1945, but because of the labor shortage the amount renewed amounted only to 2½ track miles. It is the work involved in relaying this rail that is described in this article.

Track Details

In the section of track where the rail was renewed the existing construction consisted of 90-lb. rerolled rail in 30-ft. lengths, carried on 18 ties per panel, fully-plated with single-shoulder tie plates. The ballast is pit-run gravel. In the renewal operation the existing rail was replaced with 90-lb. 33-ft. relayer rails from the main line, the lengths of which had been reduced to 31 ft. by cropping 12 in. from each end. This rail was laid with new four-hole angle bars on new larger single-shoulder tie plates, and was single spiked on each side. The existing rail was not anchored, but in the renewal work the new rail was anchored with eight anti-creepers to each rail, equally divided to prevent movement in both directions.

The work of renewing the rail first got under way in March, 1945, when it was decided to relay a sufficient amount in one location to obtain a carload of old rail urgently needed for emergency use on another division. Under ordinary circumstances the smallest rail-laying organization used on this road consists of a gang of about 40 men, equipped with a crane, a spike puller, an adzer and a power wrench. However, because of the labor shortage, this job had to be done with a gang of only 18 men, which was formed by bunching five section gangs. Further, since all available power equipment used in rail-laying work was otherwise assigned at the time, and because the urgent need for the released rail did not permit waiting until a crane and other machines could be made available, it was decided to proceed with the work without the aid of power equipment.

Organization—No Machines

With the thought of showing later in this article how the output of the gang was increased by the addition of the various machines, the organization employed when the work was done manually will be described in some detail. With this organization (and later when the power machines were brought into use) the rail on one side of the track was relaid at a time, and the work was done under traffic. When starting work at the beginning of the day an estimate was made as to how much rail could be relaid in the time available before it would be necessary to clear the track for the passage of a train. The entire organization was then used to prepare the track for receiving the new rail, with one man (a welder) cutting the bolts with an acetylene torch, seven men with claw bars pulling spikes, two men barring out the old rail, and eight men plugging the ties and adzing them by hand. As soon as the men pulling spikes finished with this work they dropped back and helped with the task of plugging and adzing the ties. When this work had been finished the entire gang proceeded back to the starting point, setting in the tie plates as they went along.

For setting in the rail, 16 of the men, with eight tongs, were used, leaving two men to apply the angle bars. When all of the rail had been set in position, 16 of the men were assigned to the task of gaging and spiking it. Initially six of these were put to work gaging the track, followed by eight men driving spikes by hand, leaving four men for tightening bolts. Finally, the entire gang was put to work applying the anchors and gathering the released material into piles. The foregoing describes the major tasks; at different times various members of the gang were assigned to other oper-

ations, such as inserting shims on loose ties to prevent the rail from becoming surface bent. Throughout this rail-laying operation, both before and after the machines were added, the gang worked 10 hr. daily.

The organization described above started laying rail on March 22 and continued this work for four days, during which time it laid a total of 3,300 lin. ft. of rail. One of the best days from an over-all performance standpoint was March 24. Of the 180 man-hours worked on that day, 140 man-hours were spent laying rail, 14 man-hours were spent cutting in for two trains, and 26 man-hours were consumed in traveling to and from the job. A total of 494 lin. ft. of rail was laid, which was equivalent to 4 ft. per man-hour actually spent laying rail.

After the 3,300 ft. of rail had been renewed it was decided to defer further work until the gang could have the use of power machines. In October a power adzer and a power wrench were made available, and the work got under way again on the eleventh of that month, using the same five section gangs, totaling 19 men, including two machine operators. Because of the small size of the gang it was not considered economical to assign a crane to it, although before starting the rail-laying work the use of a rail crane was obtained for a sufficient length of time to unload and distribute the rail to be laid.

Organization—Two Machines

With the adzer and the power wrench available the organization of the gang was changed materially, the objective being to take maximum advantage of the two machines. Initially, the welder and one laborer went ahead to cut the bolts and remove the angle bars, but following immediately behind them practically the entire gang was assigned temporarily to the work of pulling spikes, barring out the old rail, removing the old tie plates, plugging the ties, cribbing the track, and otherwise making preparations that would permit the adzing machine to get started as soon as possible. With the preparatory work finished and the adzer in operation, with an operator and a helper, followed by two men swabbing the adzed surfaces, placing the tie plates and distributing spikes, 12 men could be assigned immediately to the work of setting in the rail, rather than being employed in the time-consuming task of adzing the ties by hand.

Following behind the tong men, the angle bars and bolts were applied by a machine operator and a helper, using the power wrench. This operation required only about half the time of these two men, whereas when the work was done by hand it consumed the largest part of the time of four men. When all the rail had been set in position, about as many men were assigned to the work of gaging and spiking by hand as were used for this purpose in the original organization, and as the men were released from this and other operations, they were assigned to the finishing and other incidental work, such as applying rail anchors, shimming loose ties and piling released material.

The organization described above, using the power adzer and the power wrench, was in operation for five days, during which it laid a total of 5,796 lin. ft. of rail. A day of good performance during this period was October 13, when, working a total of 190 man-hours, the gang laid 1,240 lin. ft. of rail. The distribution of time on this day was as follows: 144 man-hours laying rail; 12 man-hours cutting in for two trains; and 34 man-hours consumed in traveling to and from the job. Thus, the unit output of the gang amounted to 8.62 ft. of rail laid per man-hour actually worked.

Other Machines Added

October 16 was the last day that the gang laid rail using only the adzing and bolting machines. Work was not resumed until November 7, when the two power machines already in the hands of the gang were augmented by a third, namely, a mechanical spike puller. However, this set-up prevailed for only one day and on the following day (November 8) a mechanical spike-driving machine was made available to the gang, in addition to the three other units already in hand. The power spike driver used on this job was the pilot model of the new machine that has been developed by the Nordberg Manufacturing Company, which was described in detail in the February issue of *Railway Engineering and Maintenance*, page 181. Briefly, this machine consists of a full-revolving frame, mounted on a

(Continued on page 291)

Left Below—The Rails Were Set in the Track by Hand. Right—a Gaging Crew

Work Equipment a Big Factor in

To prepare roadbed and tracks for the coming period of high-speed competition, the Atlantic Coast Line is carrying out a rehabilitation program which will include a major proportion of the mileage of the system. This program, begun in 1943, and now about 50 per cent completed, includes the laying of a large amount of new 131-lb. rail and cropped secondhand 100-lb. rail, the reballasting of all important lines along with heavy tie renewals, and a large amount of right-of-way grading, ditching and bank widening. To do this work the Coast Line has purchased or has on order many units of maintenance of way work equipment, which will be used after completion of the rehabilitation program to maintain its tracks to new high standards.

THE Atlantic Coast Line is pushing to completion a large rehabilitation program, designed primarily to enable it to meet post-war competition with speeds comparable to those on any other road in the country. This program includes a major proportion of the roadway, tracks, bridges and buildings on the system, and to complete it as soon as possible the Coast Line spent approximately $26,000,000 in 1945 for maintenance of way work, and approximately $4,750,000 for additions and betterments. Features of the program, in addition to its size, are the acquisition and use of a large amount of work equipment, the new modern standards of track construction adopted, and the methods employed to rush the work to completion, despite material and labor shortages.

Large Program

Although started late in 1943, little rehabilitation work was completed that year. A large amount of work was done in 1944, but the program really got underway in 1945. In the latter year a total of 582 track-miles of new and relay rail was laid in main and branch line tracks; 1,822,509 crossties were renewed; 562,986 cu. yd. of crushed rock ballast and 60,633 cu. yd. of gravel ballast were applied; approximately 700 track-miles of main and secondary main tracks were given an initial raise of 4 to 6 in. and a finish raise of 1½ to 2½ in., all on rock ballast; and more than 100 miles of branch lines were surfaced with new washed and screened gravel ballast. In addition, a large amount of ditching, bank-widening and right-of-way grading was brought to completion in that year.

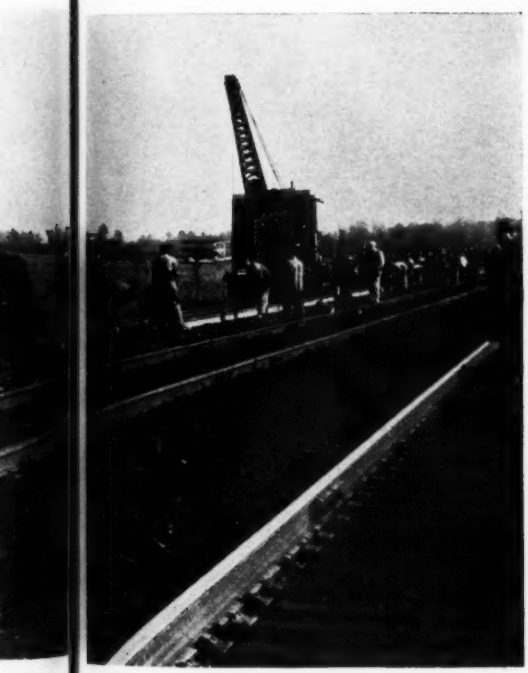
Some idea of the overall size of this program may be gained from the accompanying table, which shows the amounts of rail, ties and ballast used in 1943, 1944 and 1945, and the estimated amounts to be used in the program set up for 1946. Estimates for 1947 are not available. However, considerable main-line work will undoubtedly be done in that year, and some signal work and branch-line rehabilitation will probably still be in progress in 1948.

Left—Cleaning the Shoulder Ballast with a Mole Before Surfacing. Above—Laying New 131-lb. Rail on the Main Line

In addition to roadway and track work, a long-time program of trestle renewal work is being carried on and will be continued until all open-deck

A. C. L. Track Rehabilitation

Right — Trackage on the Richmond District Between Wildon, N. C., and Emporia, Va., Which Was Recently Relaid with 131-lb. Rail and Surfaced



trestles have been replaced by permanent trestles of concrete construction or creosoted timber with ballast-decks; a number of steel spans have been strengthened and gangs were put on in 1945 to catch up on deferred steel bridge repair and painting work; a general program of building rehabilitation has been started; and a signaling program is being planned.

The remainder of this article will be confined to the organization, methods and equipment used in the roadway and track improvements on the double-track main line between Richmond, Va., and Jacksonville, Fla., with only brief reference to similar work on other lines.

The Main Line

The double-track main line of the Coast Line between Richmond and Jacksonville offers attractive possibilities for high-speed operation because it traverses the rolling coastal plains along the Atlantic seaboard and has easy grades and few curves. For this reason, practically no curve or grade reduction work is planned in the present program, although in one case both main lines are being relocated through a small town to eliminate a slight reverse curve at each edge of the town. In the work, however, except at points where other features limit speed, all old center passing tracks are being eliminated and are being replaced by new passing tracks on the outside to permit straight alinement for both main tracks.

The rail program covers both tracks of the main line between Richmond and Jacksonville, and all of the single-track main line between Jacksonville and Tampa, which are being relaid with new 131-lb. rail, releasing 100-lb. rail. In 1945, 326.67 track-miles of new 131-lb. rail were laid in the main line, bringing the total amount of this rail laid since 1943 to 513.82 track-miles. In addition, in 1945, 213 miles of 100-lb. relay rail laid in secondary main lines, and 43 miles of 85-lb. relay rail were laid in branch lines, releasing 70-lb. rail. The program for 1946 calls for 325 track-miles to be relaid with new 131-lb. rail, and a similar mileage will probably be relaid in 1947. Corresponding amounts of cropped 100-lb. and 85-lb. relay rail will be laid on secondary main lines and branch lines, respectively.

All important sidings on the main line are being relayed with 100-lb. rail as the main line rail-laying programs progress. For cropping the

Rehabilitation Program

	Track Miles of New Rail		Crosstie Renewals (Maintenance only)	Ballast Placed (Cu. Yd.)		
	131 Lb.	100 Lb.		Crushed Stone	Gravel	Slag
1943	18.20	54.46	1,170,226	137,944	.....	25,825
1944	168.95	.....	1,180,427	215,682	39,993	42,947
1945	326.67	.....	1,822,509	652,986	60,633	.....
1946*	325.00	.....	1,750,000	700,000	50,000	.....
Total	838.82	54.46	5,923,162	1,706,612	150,626	68,772

*Estimated

Above—Final Surfacing on the Main Line with an 8-Tool Electric Power Tamping Machine. Right — Another Scene on the Main Line Showing a Pneumatic Eight-Tool Tamping Machine Making the Final Surface

released 100-lb. rail for use in secondary main lines, a large rail yard and cropping plant are being set up at South Rocky Mount, N.C. The cropping plant will be equipped with a friction saw, an electrically-operated gang drill and a straightening press. Eighteen inches will be cropped from each end of all rails to eliminate all secondary batter, all brine-corroded areas near the ends of the old joint bars, and hidden defects in the vicinity of angle bars not registered by detector cars.

Much of the new rail is end-hardened at the mill, but when this is not done it is end-hardened in track shortly after it is laid by an oxy-acetylene process. The new rails are joined by 36-in., 6-hole, 100 per cent head-free joint bars with 1/64-in. lateral center overfill, and R.M.C. plastic joint packing is being applied at all joints. Improved spring washers are used on all joint bolts, and the emergency standard A.R.E.A. double-shoulder 14-in. by 7¾-in. tie plate for 131-lb. rail is being used.

On tangent track the rail and tie plates are fastened to the ties by two gage spikes and two or more hold-down spikes per tie plate. On curved track and on bridges, full spiking is generally used. All spikes are 9/16-in. by 6-in. cut spikes. Ten anti-creepers are applied per 39-ft. rail, eight to prevent movements with the current of traffic, and two to prevent movement in the opposite direction.

With the new rail, No. 10 turnouts with spring-rail frogs and 16½-ft. switch points are standard, except on the Jesup cut-off of the road, which is used primarily for the fast passenger trains, and at the leaving ends of four new passing tracks on the main line, where No. 16 spring switches with 22-ft. switch points were installed. At the ends of double-track, No. 20 turnouts with 30-ft. switch points and rigid manganese-insert frogs have been installed.

Rail-Laying Operations

Most of the new rail is being laid by a large, mechanized rail-laying gang, which is given full use of the track. This gang is in charge of an assistant roadmaster and includes an extra-gang foreman, three assistant foremen and 103 laborers. The organization and equipment used, are as follows:

The head end of the gang, under the first assistant foreman, includes bolt-loosening machines, a cribbing machine, spike-pullers and adzers.

Four men with a push car distribute spikes, tie plugs, bolts and spring washers, following which four men, with two bolting machines, remove the nuts from the old track bolts.

One man with a light sledge and a bar knocks out the bolts and jars the joint bars loose.

Six men follow with two spike-pulling machines, and one man behind throws the old spikes and joint bars out on the subgrade shoulder.

Two men with lining bars shove the old rail out.

One man, using a track spike for a hook, throws the old tie plates out on the shoulder, and is assisted 50 per cent of the time by one of the following punch men.

Two men with a punch and sledge drive down any old spike stubs.

Four men set tie plugs and two men with special tie-plug drivers (a ¾-in. plate welded onto a ¾-in. metal rod) drive down the plugs.

Two men operate a cribbing machine

to lower the ballast between the ties directly opposite the tie plate seats.

Six men operate three power adzing machines.

One mechanic accompanies the head end of the gang and sees that all machines are operating properly.

One mechanic's helper, with a push car on which is mounted a grinder powered by a small gas engine, sharpens the adzing bits.

The second assistant foreman has charge of the rail crane, and bolting and gaging operations, as follows:

One man with a bucket and brush mops the newly-adzed tie plate seats with hot creosote.

Two men hand new tie plates to two other men, who place them on the ties.

Four men, including the crane operator, set the new rail in place, using a Burro crane, and one of these men places the expansion shims.

Three men with a push car, attached to the crane, unload R.M.C. plastic joint packing and lay the pre-molded sections on the inside faces of the new joint bars, which are placed on opposite sides of the joints, ready for application.

Three men, one with a joint-bar clamp, apply the joint bars, inserting a bolt at each end and turning the nuts tight enough to hold the bars in place.

Two other men put the other four bolts in place and start the nuts.

Two bolt-tightening machines, each operated by one man, and each set for 18,000-lb. bolt tension, tighten the nuts, the middle bolts being tightened first to avoid cooking the bars.

Three gaging crews follow, each consisting of four men, one with a gage, one with a lining bar, one for nipping the ties, and one for driving the spikes down about half-way. The head gaging crew gages joints and centers, and is followed by two men with special 10-lb. hammers who put every tie plate exactly under the rail. The other two gaging gangs follow and gage every third tie.

Behind the gagers is a spiking crew of 13 men, with 6 men setting spikes and 4 men driving spikes, the latter employing pneumatic spike drivers powered by 2 four-tool compressors mounted on a push car. Two men nip the ties and one man moves the push car.

This portion of the rail gang also has a mechanic's helper assigned to take care of the machines.

The third assistant foreman is in charge of the remaining force and work, as follows:

Eight men with a push car, unload and apply 10 rail anti-creepers per 39-ft. rail.

Twelve men tamp up all swinging ties, including the ties under the old 100-lb. continuous joints, which have been marked previously. These 12 men use four pneumatic tampers and a four-tool compressor mounted on a push car.

In 1945, this rail-laying organization laid approximately 175 track-miles of rail, and it has laid as much as 416 39-ft. rails in one day. The average production is 4 to 5 miles a week, including 2 to 4 switches.

While most of the new rail is being laid by this company's rail-laying gang, more than 28 miles on the main line and most of the 100-lb. and 85-lb. relay rail laid to date has been laid by several contractor's gangs of somewhat smaller size.

Formerly, the rail-laying gang was preceded by a 30-man cribbing gang consisting of 30 laborers, one foreman and one assistant foreman. This gang was equipped with an electric four-tool tamping outfit and special cribbing forks. In track that has had the ties renewed and that has been given an initial surface, however, this cribbing gang is not necessary because the ballast is left a little low. Where such conditions have prevailed, two men with a cribbing machine have been added to the regular rail gang ahead of the adzers.

With the large rail-laying gang, all material, including rail, is unloaded ahead of and is picked up behind the rail-laying operations, while the track is killed, using two work trains. The gang with the head work train consists of a foreman, an assistant foreman, a crane operator and 30 laborers. The No. 2 work train, which picks up all released rail and other material, also consists of a foreman, an assistant foreman, crane operator and 30 men. The loading operation usually keeps within ½ to 1 mile behind the rail laying.

Tie Renewals and Ballasting

The Coast Line used 1,822,509 crossties for renewals in all tracks in 1945. Heavy renewals were needed to protect and to get full benefit from the new rail, and to offset the large amount of deferred maintenance that accumulated during the depression years. Furthermore, inability to purchase needed ties during the early war years, because of labor and other conditions in the tie-producing areas, were contributing factors.

To obtain the necessary ties for this program, strenuous efforts were required to induce the producers, which had shifted to cutting pulpwood or to work at defense plants, to return to cutting ties. To accomplish this, railroad representatives, including traffic representatives, were sent out into all the tie-producing areas in the territory served by the railroad, to appeal to the producers. These men persuaded many of the small producers that owned timber to cut ties. In fact, the Coast Line's company-owned plant at

Gainesville, Fla., which is leased to the American Lumber and Treating Company, has been able to operate practically at capacity. Also, ties were shipped to commercial plants at six other points for treatment.

Tie renewals and tie spacing are done in conjunction with the initial surfacing on new ballast. In this work, all ties are spaced 19½ in. apart, center-to-center, to provide 24 ties under each 39-ft. rail and a three-tie support for each joint. The work varies somewhat, depending upon the condition of the old ballast.

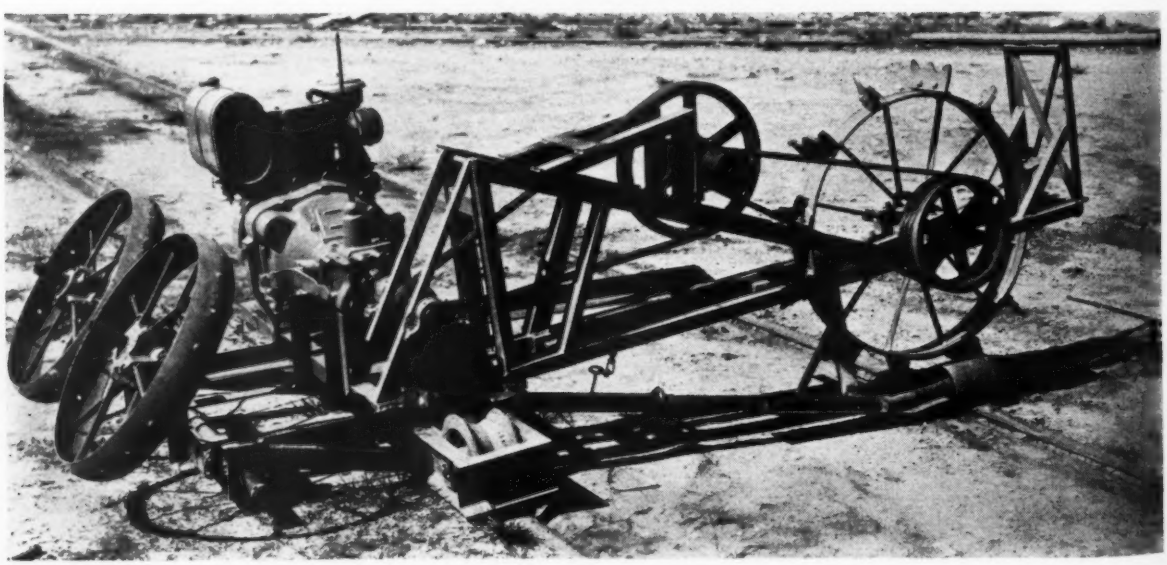
If the ballast is exceedingly foul, or if the tie renewals are exceptionally heavy, all the old ballast is removed and spread on the subgrade shoulders. If the ballast is not badly fouled, it is used with some additional new ballast to make the initial raise and new ballast is applied later to fill the tie cribs. In the latter type of operation, the old shoulder ballast is either plowed out in advance to a level below the bottoms of the ties, using an angle dozer or a Jordan ditcher-spreader, or the ballast on the shoulder and in the inter-track space is cleaned in advance with Mole ballast cleaners. By these methods, good track drainage is assured for the new rail. Similar methods are used for reballasting track laid with relay rail on secondary main lines, and for surfacing with gravel ballast on branch lines, except that the Mole ballast cleaners are not used and the raises in the initial and final surfacing are not as high as are used on the main line. The rock being used for ballast is a crushed granite, which is much harder than the limestone available in this region. It is crushed, screened and washed to meet A.R.E.A. specifications for such ballast, with the maximum size of the particles being 2½ in.

Gang Organization

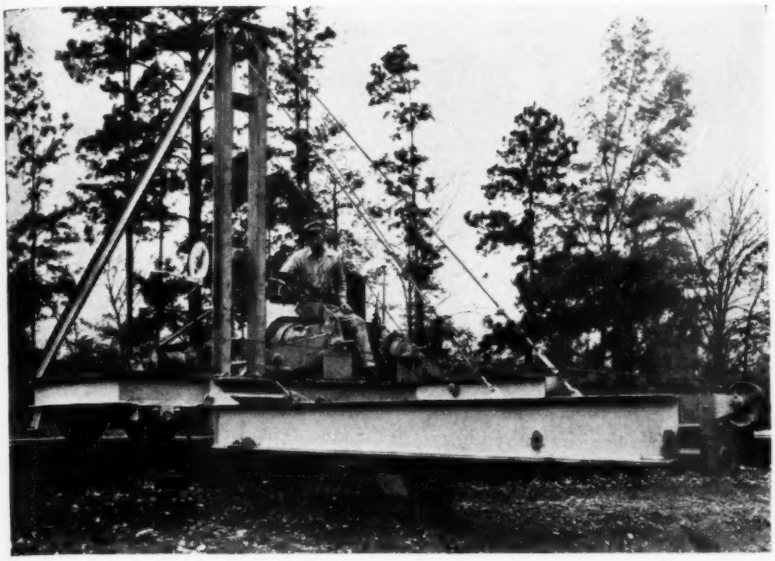
The organization used for tie renewals and spacing, and for the initial surfacing, varies somewhat, depending on conditions, but two 20-man gangs are usually employed for this work. These gangs work together, using 12 to 16 jacks. The first 20-man gang renews the ties and, if tie renewals are heavy, throws out all the old ballast while the track is jacked up for the renewal work. For this work, a 25 to 35-m.p.h. slow order is used, depending upon the judgment of the roadmaster.

The second gang of 20 men works along with the tie renewal gang and tamps the ties by hand, using ballast forks or spades, as fast as renewals and spacing are completed. In this raise, which usually runs four to six inches, the track is raised nearly to final grade and each tie is tamped throughout its full length. Additional ballast, as required, is unloaded beforehand by a work train.

A third 20-man gang makes a final raise of 2 to 2½ in., which is tamped with power tampers. This gang works at least 1½ to 1¾ miles behind the initial surfacing gang so that trains will thoroughly settle the track before the final running surface is made. Out-of-face tamping is employed in this work, leaving 12 in. untamped at the center of each tie. This gang uses 10 jacks, spaced about one-third of a rail length apart, and 2 four-tool electric tampers, with portable two-wheel power units, which can be moved along on the subgrade shoulder. This gang drops back and lines



Below — One of the New Cribbing Machines Used in Rail Laying Work. Right— The Tie Nipper Machine in Operation with Spike Drivers



The Stripping Machine Removing Foul Ballast in Advance of Surfacing

track at every opportunity, particularly when waiting for trains.

In addition to the above gangs, a final 20-man gang, with a foreman and an assistant foreman, is used to dress the track and to correct any minor irregularities. This gang works about ½ to 1 mile behind the final surfacing gang. Six men in this gang are equipped with an electric four-tool portable tamping outfit, and correct any defects in surface. The other 14 men dress and line the track and do any other work needed. Both the final surfacing gang and the dressing gang also check gage and drive hold-down spikes after any variations in gage have been corrected. Finally, all bolts on new or relay rail are re-tightened 30 to 60 days after laying, and four times a year thereafter.

Other Work

A large amount of bank widening and ditching is being done in connection with the other track improvements described, although fortunately for the Coast Line, the subgrade on its lines traversing the coastal plain is relatively stable, consisting generally of a sandy loam, which packs well and drains readily. Bank widening and ditching have already been completed for some distance south of Richmond and north of Jacksonville. In many places, complete right-of-way grading is being done, providing flat slopes to ditches near the right-of-way lines, and about 20 miles of this class of work has been completed on a secondary main line. In addition to the classes of work described, the Coast Line will experiment in 1946 with the grouting of soft spots in track in the vicinity of Stony Creek, Va.

Some grading and ditching work have been done by contract. The railroad has also been using its own off-track equipment for these classes of work, which includes draglines, bulldozers and angledozers. On-track equipment used by the railroad includes American ditchers and air-dump cars of 20 to 25-cu. yd. capacity. In 1946 the road will operate three ditcher work trains, employing a total of six ditchers, by adding two ditchers, one of which is being purchased and the other being repaired.

Work Equipment

From $500,000 to $600,000 has been authorized by the railroad for the purchase of new maintenance of way work equipment of all kinds for the rehabilitation program. A list of the more important units of such equipment purchased since the program was begun, including that authorized for purchase this year, is as follows:

Maintenance of Way
- 74—4-tool electric tamping outfits
- 26—4-tool pneumatic tamping outfits
- 3—track grinders
- 4—rail-laying cranes
- 3—draglines
- 1—ditcher
- 2—air-dump cars
- 1—spreader
- 1—2½-cu. yd. crawler shovel
- 24—ballast cleaners
- 18—ballast cleaner derricks
- 4—crawler tractors with bulldozers
- 4—crawler tractors with angledozers
- 1—road patrol power grader
- 8—tractor mowers
- 12—tie adzing machines
- 16—pneumatic spike drivers
- 14—spike pullers
- 4—portable rail saws
- 4—power rail drills
- 26—bolt tightening machines
- 1—air compressor, 105 cu. ft.
- 1—electric welding machine, 300 amperes
- 1—electric welding machine, 200 amperes
- 1—pneumatic impact wrench
- 26—gas engines with grinder attachments

Bridge, Building and Water Service
- 5—hand-operated derrick cars
- 2—portable bridge outfits, saw, wrench and drill
- 1—50-ton locomotive crane
- 1—single-acting steam pile hammer
- 11—concrete mixers
- 12—portable electric saws
- 1—radial saw
- 2—table saws
- 2—electric drills
- 1—floor sanding machine
- 1—planer
- 1—double-drum winch
- 1—paint spray outfit
- 2—steel shears
- 2—steel bar benders
- 1—paving breaker
- 1—sheet pile driver
- 2—concrete vibrators
- 4—portable 2-in. pumps with suction hose
- 1—electric motor, with 21-in. V-belt
- 1—shaper
- 2—air compressors
- 1—4-in. "Mud Hen" pump
- 1—drill press
- 1—single-spindle borer
- 1—power chain saw
- 4—electric generator sets
- 2—impact wrenches
- 3—grinders, pneumatic
- 1—rivet buster
- 1—3-in. gas-driven pump
- 1—pile extractor
- 2—pneumatic drills

Signal Department
- 14—grinder outfits
- 3—air compressors, gasoline-driven
- 1—combination grinder and buffer

In addition to the above railroad equipment, a number of completely mechanized contractors' gangs were used in rail-laying work and in some right-of-way grading, ditching and bank widening. Besides the many units of rail-laying and tamping equipment used, these contractors have been using the following units of grading equipment:

- 7—draglines
- 9—bulldozers
- 1—angledozer
- 6—crawler tractors
- 2—motor graders
- 23—trucks
- 3—5-yd. LeTourneau's
- 1—Galion roller

New Machines

In this connection, it is of interest to note that several of the contractors on this work have developed new track machines to aid them in their operations. Outstanding among these

machines are a number developed by the Royce Kershaw Company, Montgomery, Ala., which include a cribbing machine for rail-laying work; a pneumatic tie-nipper, with compressor and spike drivers, for tie renewal work; a combination ballast plow and track dressing machine; and a rail-laying machine. The C. G. Kershaw Contracting Co., Birmingham, Ala., has developed an on-track cribbing machine, called a stripping machine, for removing foul ballast from between the ties before surfacing, and a cribbing machine for rail-laying work.

A Ballast Plow and Dressing Machine

Cribbing Machine

The cribbing machine for rail-laying work, developed by the Royce Kershaw Company, is placed on the remaining rail, after one rail has been removed, and lowers the ballast between the ties to a depth of approximately four inches below the tops of the ties. In actual operation it has removed ballast from one side of the track over a distance of as much as 6,000 lin. ft. in a day, using one operator and one man to push the machine along the rail. This machine has a digging wheel which revolves at approximately 75 r.p.m. and causes the ballast to be displaced toward the outer ends of the ties. It is powered with a single-cylinder air-cooled motor of 9½ hp., which drives the main cutting wheel through a clutch and gear reduction of about 12 to 1. A "V"-belt drive is used to afford the necessary flexibility and also to permit slippage when the drive wheel encounters a large rock or some other obstacle between the ties.

The machine is provided with a detachable arm and rollers for movement on the track while in operation and in going to and from the work, and with two steel-tired wheels at right angles to the track rollers, which are used to handle it to and from the track. While the machine is in operation, these main wheels are used as a counter-balance. The entire machine, which is operated by two men, weighs approximately 1,000 lb.

The pneumatic tie nipper is a car-mounted, self-propelled, on-track unit, with a compressor which is used to propel the car by means of an air-motor, and also to operate a tie-nipper arm and pneumatic spike drivers. At the end of the tie-nipper arm, which extends out in front, are tie tongs which clamp the tie at the center. The tongs are raised to pull the tie firmly against the base of the rail with sufficient pressure to allow spiking with pneumatic spike drivers on both ends of the tie at the same time. The crew with this machine consists of 9 men, including a machine operator, 1 man who sets the tongs, 1 man who lines up the ties, 2 men operating the spike drivers, and 4 men who set spikes ahead. As much as 3,200 ft. of track have been spiked up with this machine in 6 hr.

Ballast Plow and Dresser

The ballast plow and track dresser has a plow and wings made of steel plates and angles operated by cables and winches, which are mounted on the front and sides of an automobile truck equipped with flanged wheels for on-track operation. This machine is used to remove surplus ballast from the center of the track and to dress the ballast shoulders. The first operation with the machine is to plow the ballast out from the middle of the track and place it on the shoulder. Following this, the dresser wings are lowered to a rough dressing position and, as the machine moves along the track, they distribute the shoulder ballast uniformly. In subsequent passes of the machine, the wings are lowered progressively until the final ballast section is produced. This machine has completely dressed as much as 2,500 ft. of track in one day with a crew of four men.

The special rail-laying machine developed is a self-propelled crane with a 25-ft. horizontal boom having a capacity of 1½ tons at 25 ft. radius. The machine is operated by a 20-hp. air-cooled gas engine, which also operates a two-drum hoist. The boom can be swung 30 deg. off center. This machine has been used with four men and an operator to place 4,800 track-feet of 131-lb. rail in a period of seven hours.

The stripping machine developed by C. G. Kershaw & Co. is mounted on an 8½-ft. by 14-ft. self-propelled car, and is powered by a Ford motor. The motor is geared to a square shaft for operating a six-inch screw auger supported horizontally on an 11-ft. beam, the beam being hinged to the side of the car so that it can be raised to the vertical position by a hand winch for movement from job to job. The auger, which is 10 ft. long and has a cast steel cutter head, is moved back and forth between the ties by a reversible friction drum. During stripping operations, an automatic spotting device, which strikes the edge of successive ties, stops the car at the correct position so the auger will enter the space between ties. This machine can be moved from job to job at a top speed of 30 m.p.h.

Two cribbing machines for rail-laying work were also developed by C. G. Kershaw & Co., which are quite similar to that developed by the Royce Kershaw Company, one for heavy ballast, badly fouled, and the other, somewhat lighter, for work in ballast that can be displaced easily.

A Difficult Phase

One of the most difficult phases of the Coast Line's program has been that of securing adequate labor and materials. Furthermore, most of the labor secured has been of indifferent quality and the turnover has been high, so that unremitting efforts have had to be continued to keep the gangs up to strength.

During 1945, the maximum number of men employed on the rehabilitation work included from 1,600 to 1,800 laborers. These do not include the regular section forces, which were also augmented as much as possible and used, in many cases, to help prepare for and complete the track work.

All of the work described in this article has been planned and executed under the active direction of C. McD. Davis, president of the Atlantic Coast Line.

Small Rail Gang Gets Machines

(Continued from page 283)

carriage by means of which it is rolled along on the rails from one spiking position to another. The revolving frame is a balanced beam containing, at one end, a revolving mechanical hammer, and, at the other, a 6-hp., 4-cycle, single-cylinder air-cooled gasoline engine which drives the hammer by means of three V-belts. The blows of the revolving hammer are delivered to the spike through an anvil, the lower end of which engages the top of the spike.

Weighing 28 lb., the revolving hammer rotates at a speed of 1100 r.p.m. and strikes blows of 4,000 lb. The spike hammer drives one spike at a time, but through the swing of its frame it can be moved from one side of the rail to the other to permit the driving of spikes on both sides. For use with the spike driver a special spike holder has been developed, by means of which the spikes are placed and held in position for driving. Two of these spike holders are used with each spike-driving machine. The unit is operated by a crew of three men, including an operator and two laborers for handling the spike holders.

Organization—Four Machines

During the period when rail was laid with the help of the four machines, the gang was comprised of six section gangs, totalling 22 men, including three machine operators. With the inclusion of the spike puller and the spike driver in the organization, the method of procedure and the assignment of duties were again changed materially as compared with the organization that prevailed when the adzer and the bolting machines were the only two power units used.

With the four machines in use the organization employed can best be described by beginning at the start of a day's work. To the foreman located closest to the work, who had a gang of four men, was assigned the task of transporting the machines to the job and of getting them in readiness to start work. The second section gang to arrive, with one laborer and two machine operators, immediately started to work pulling spikes with the mechanical spike puller. In the meantime the welder and a helper had arrived and had started to cut the joint bolts, while the first foreman, having finished preparing the machines for use, put his men to work throwing out the rail, digging ballast from between the ties in preparation for the adzer, and plugging the ties.

When the third section gang arrived with one machine operator and one laborer, the work had progressed to a point where this gang could be put to work operating the adzer. Following behind the adzer, the fourth section gang, with two laborers, started swabbing the newly-adzed surfaces and applying the new tie plates. The fifth and sixth gangs, each with two laborers, assisted in applying the tie plates, distributing material and doing other work.

As soon as sufficient men could be released from the preliminary work they returned to the starting point and began setting in the rail, being followed by one of the operators and a helper applying the joint bars and bolts with the aid of the power wrench. Three men then started gage spiking, and when all the rail had been set in position, three additional men were assigned to this work. When the latter work had progressed sufficiently, the spike-driving machine, with one operator and two spike setters, was placed in operation, and with this machine doing the spike driving, practically all the remaining men in the gang could be put to work applying rail anchors, piling released material, shimming loose ties, and distributing material for the next stretch of rail to be laid.

During the time that the foregoing organization was engaged in laying rail, the performance of the spike-driving machine was observed carefully. After the crew operating the machine had become experienced in its use, the best record achieved was the spiking of one rail (18 ties or 36 spikes) in 1 min. 30 sec. On the day during which the peak performance was achieved with the spike-driving machine the average elapsed time for spiking each rail was 1 min. 52 sec. The ties in the territory where the spike-driving machine was used were divided about equally between hard and soft wood. The experience with the spike driver was that it could be used all day without a change of operators or spike setters and that it was capable of driving as many spikes as could be driven by 12 men using spike mauls.

Output Up Further

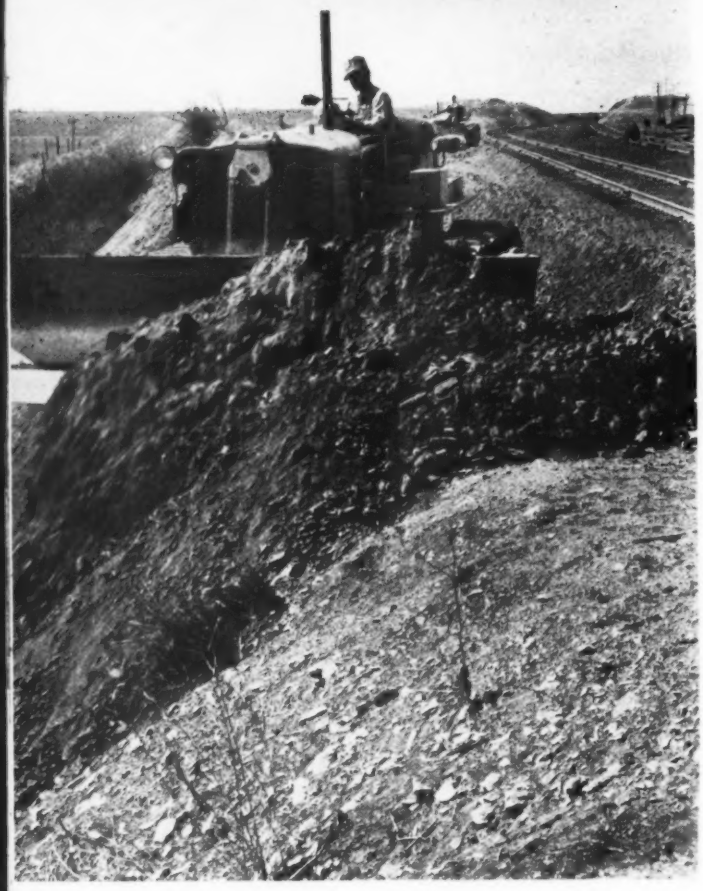
After the spike puller and the spike driver had been added to the complement of machines in use by the rail gang, it continued to lay rail for nine days, during which a total of 15,536 lin. ft. of rail was renewed. The best performance during this period was achieved on November 14, when 2,480 lin. ft. of rail was laid. The 220 man-hours worked on this day were distributed as follows: 174 man-hours laying rail; 11 man-hours cutting in for one train, and 35 man-hours traveling to and from the job. Thus, the average output of the gang while actually laying rail was 14.25 lin. ft. per man-hour worked.

That the performance of the gang on November 14 was not greatly in excess of that achieved during other days of this period is indicated by the fact that on November 19 it laid 13.75 lin. ft. of rail per man-hour actually engaged in constructive activity. Again, on November 15, the average amount of rail laid was 12 lin. ft. per man-hour.

In comparing the production figures for this gang when using power equipment with the output when the work was done manually, it is important to bear in mind the fact that, because of the limited size of the gang, the full potentialities of the machines were not realized. Obviously, if the gang had been of such size as to permit the machines to be kept in operation a greater percentage of the time, the performance would have been even more striking.

The rail-laying work described in this article was carried out under the general direction of E. C. Vandenburgh, engineer maintenance of the Chicago & North Western System, and of P. V. Thelander, division engineer of the Galena division, both of Chicago, and was under the direct supervision of A. Netzel, roadmaster at West Chicago.

This Poster, No. 270, Constitutes the March Installment of "All the Year—Every Year Safety Program" of the Safety Section, Association of American Railroads



Investment in Machines Is Productive Only to the Extent They Are Used

Need for Work *But So Are*

Visualizing the problems ahead for the maintenance forces, in the light of the need for higher standards of construction and maintenance, continuing shortages in efficient man-power, and increased wage rates, the three contributors to this article see the need for further mechanization of various maintenance operations, including a number which have not yielded to machine methods to date. At the same time, they call for care in the selection, operation, maintenance and repair of such equipment, and insist that it be used intensively in well-prepared programs.

As Management Sees It

By R. W. Barnes

Vice-President
Southern Pacific Lines
in Texas & Louisiana, Houston, Tex.

THE four primary objectives in the use of work equipment in the maintenance of way and structures department are: (1) To reduce the cost of carrying out any unit of work; (2) to extend the useful life of materials in track and structures by means beyond those otherwise available; (3) to reduce the hazards and the manual exertion involved in performing such work; and (4) to increase the service life to be obtained from the work performed.

The objective of all officers in charge of maintenance of way and structures work are, and should be, to provide a more substantial, safer and smoother track, at less over-all cost and with a better safety record. This must be done today with labor that is less attracted to heavy manual work and that is paid more per hour than ever before. Obviously, therefore, to accomplish the results desired, additional work equipment, and better use of that now owned by the railroads, will be required. Fortunately, suitable power tools and machines are available for practically all classes of grading and subgrade work; likewise for most types of bridge and building work. The same is true with respect to operations involving rail and other track material. However, the equipment available for tie renewals, ballasting and resurfacing operations, which demand a large share of our available labor, is not a complete answer to the problems presented. Progress is being made, but as yet there is in general use no reasonably light equipment with which to change out ties, to remove ballast from the tie cribs, or to resurface track, necessitating the continued use of an inordinate amount of hard labor for these operations. Tie tampers, cribbing tools and tie saws help, but the problems presented still await solution.

The use of power tools and roadway machines, under reasonably good supervision, reduce accidents by reducing the number of men in a position to get hurt, and by minimizing the amount of heavy manual lifting from insecure positions. Their use also invites carrying out work leading to improvements that could not be attained otherwise, such as in drainage of the roadbed and ballast shoulders, in track surface, in structures, and in many other items of work, all leading to a generally improved condition of our properties and lower costs. Some of the gross anticipated savings from their use is nearly always absorbed by carrying out on each job incidental improvements leading to better over-all maintenance, which would not otherwise have been considered at all.

At the same time, power tools and machines in quantity present new problems which, unless well solved, will substantially destroy the primary objective in their use—reduced over-all cost. In the first place, such equipment involves a substantial investment, which is productive only to the extent it is used. In addition, it in-

Equipment Increasing—
Responsibilities In Its Use and Upkeep

volves the use of higher skills in operators, at substantially higher rates. Moves from job to job with such equipment are a dead loss in time and money, and must be minimized as to number and distance. Housing and transportation to the work for operators, except in the case of small power tools, involve additional problems and expense.

To pay off, power tools and machines must be kept in good running condition; they must be used every working day they are in working order and are in a position to be used; and they must be kept on jobs planned and scheduled in advance. Work schedules must be arranged to hold down the time and distance of equipment moves between jobs, and such moves should be progressive.

All of these considerations require that:

(1) All equipment, except small power tools assigned to individual gangs, should be in charge of, and its assignment directed through, the chief maintenance officer.

(2) A maintenance shop for such equipment should be under the direction of the chief maintenance officer, and should do all repair and overhaul work.

(3) A supervisor of equipment should hire the operators, look after repair materials, and decide on the program for maintaining the equipment.

(4) An assistant should be on the road checking the performance and condition of all units, arranging for light repairs, instructing operators, and checking against its misuse or abuse.

(5) The use of equipment should be scheduled according to a definite program, previously agreed upon with division officers.

Unless these things, or the equivalent, are done, far less than full benefit will be attained from our investment in work equipment.

Many Developments to Date, But Field Is Still Wide Open

By H. R. Clarke

Chief Engineer
Burlington Lines, Chicago

THE use of work equipment in the maintenance of way department has been increasing steadily for many years and more rapidly during the last few years than ever before. The reasons justifying the initial purchase and expense of operating work equipment remain the same as they have always been. Before we can recommend the purchase of equipment, we must know that its use will do at least one of four things:

(1) Make possible necessary work which could not be done at all without the aid of machines.

(2) Do work for which labor is not available.

(3) Do better and more permanent work than can be done by manual labor.

(4) Result in a net saving.

The importance of these various justifications for the purchase of work equipment, and the weight given them, change and have changed from time to time in the past. The first stated is one of long standing and, naturally, is always considered. At present the second reason has great weight, but, with the labor situation improving, its special importance may not continue very long, or at least, it may become less important than it is just now. The last two reasons really merge into one since better and more permanent work results in economy, and as wage rates go up, as working rules and regulations become more restrictive, and as the efficiency of available labor decreases, work equipment becomes more attractive and more necessary. These considerations apply to the work that is done in all branches of the maintenance of way department.

The development in work equipment during the past 25 years has been remarkable. Twenty-five to 30 years ago almost all of the equipment available, such as pile drivers, derricks, steam shovels and cumbersome spreaders, was restricted to on-track operation, was operated by steam power, and was heavy and awkward. This equipment, however, served its purpose, that is, it enabled us to handle heavy materials and to do work impossible without its help. Today, gas, Diesel, or electric power has largely supplanted steam, greatly increasing the availability and flexibility of the machines. Off-track equipment of many kinds is available and is coming into more general use, and machines are designed and manufactured to assist in nearly all operations in all departments—track, bridge, building and signal.

This increase in both the kinds of equipment available and in the total number of units of all types in use gives rise to another set of problems, that is, supervision, organization and maintenance. When only large equipment was in use, it was generally assigned to heavy construction projects, for which adequate supervision could be readily provided. Now, with smaller and more flexible units scattered over the railroad in almost every section, bridge and building and signal gang, as well as extra gangs, it is more difficult to provide such supervision, although the need for it is greater than before.

It is not uncommon for a railroad of moderate size to have equipment costing perhaps $5,000,000 to $6,000,000 scattered over several thousand miles of road, with little organized supervision, depending almost entirely upon the division and district officers to see that it is properly utilized. This is not an effective or efficient plan.

When the type of equipment and the work to be done make it possible to do so, machines should be assigned to divisions, and even to individual gangs, in which case the division officers and foremen should be held responsible for the proper use of the

units. Even with this assignment, additional specialized supervision is necessary, and men capable of instructing machine operators, of checking the condition of the equipment, and of making running repairs, will prove to be a good investment. When, to utilize equipment fully, it is transferred from one gang to another, or from division to division, the programming of its assignment and specialized supervision are of still greater importance and advantage. The organization need not be a large or elaborate one, consisting perhaps of a supervisor of work equipment, an assistant and several traveling maintainers, the number of maintainers, of course, depending upon the size of the railroad and the amount of equipment in use. Each of the maintainers should be furnished a small truck supplied with necessary tools and small repair parts so that adjustments and minor repairs can be made as the various machines are inspected. Depending on the distances involved and available train service, it may be worthwhile also to furnish an automobile for the use of the supervisor and his assistant.

This organization should be responsible for the inspection and maintenance of the equipment, for shopping it when necessary, and for the training and supervision of operators, but not for programming the assignments of the equipment or for its production. The latter are the responsibility of system, district and division maintenance officers, and how that responsibility should be handled depends upon the general organization of the maintenance department. An equipment maintenance organization such as has been suggested, should, as already stated, be responsible for minor repairs, adjustments, etc., which can be made in the field. It should also decide when machines must be shopped for heavy repairs and should submit a work report when the equipment is sent to the shop for repairs.

For heavy repairs, equipment should be sent to a shop that is adequately equipped and organized to do the work. In the shop, each machine should be dismantled, carefully inspected, and completely and thoroughly repaired before it is returned to service. On some roads heavy repairs are made by mechanical department employees, the work being done in a portion of a locomotive or car shop set aside for the purpose, while in other cases repairs are made in smaller separate shops under the supervision of the maintenance of way department and manned by employees of that department. The plan followed is not important if a workmanlike repair job is done. It has been argued that better results are obtainable if the work is handled by the maintenance of way department. This need not be the case if it is understood that the work, if done by mechanical department employees, is not a side line with them, to be done or not at their convenience, but is fully as important as locomotive or car work. In fact, I think there are advantages when work equipment repairs are so handled.

Unquestionably the use of work equipment will continue to grow and the investment in this account will continue to increase as the advantages possible in the use of such equipment become greater and more evident, and as the equipment available is improved and so becomes more efficient and attractive. The proper design and most effective use of work equipment challenge both maintenance officers and equipment manufacturers to be continually on the alert, and requires constant careful study of this problem on their part.

Job Not Finished

As stated previously, there has been remarkable improvement in the work equipment that has been made available to the maintenance forces, and great progress in its more efficient use. This does not mean, however, that the job is finished and that no further progress is possible. Almost every machine in use today can be further improved, and many improvements are constantly under way. This suggests that those on the railways who are responsible for this equipment must be alert to see that, so far as possible, the equipment in service is kept up to date so long as this is economically justified, and that obsolete machines are scrapped and replaced when improved equipment has been developed that will justify its purchase.

Also, there is still a large amount of important maintenance of way work for which suitable equipment has not been designed and built—much of which, in my opinion, lends itself to mechanization. Here too, however, progress is being made, and the joint efforts of railroad maintenance men and equipment manufacturers will, I am sure, see most of these operations mechanized eventually.

Some equipment, such as wrecking derricks and snow plows, are justified even if used infrequently, because when they are needed at all, they are indispensable. In general, however, most equipment must be kept in use at least the greater part of the maintenance season if its ownership is to be justified. Careful programming of work and assignment of equipment are necessary to accomplish this objective.

Owing to the fact that maintenance of way work on many roads is necessarily seasonal, with the period during which equipment can be used necessarily limited by weather conditions, machines which can be used for more

Equipment Repairs Should Be Made in a Shop That Is Adequately Equipped and Organized

than one purpose are attractive. However, where a machine is necessarily built to handle certain specific operations, judgment must be used to insure that added attachments are not added to it to the point where it becomes less efficient when used in the work for which it was primarily built.

Need Number of New Machines—More Intensive Upkeep and Use

By T. G. Sughrue
Chief Engineer, B. & M.
Boston, Mass.

AS WE see the picture on the Boston & Maine, the efficient use of work equipment will be of the utmost importance to us in the maintenance of way department in the months to come. Because of the much keener competition which the railroads must expect, the service they will be able to render must be improved. This will call for increased speeds—both on line and in terminals. These increased speeds, in turn, will throw additional burdens on the maintenance of way department to provide both the kind of track and other facilities that will be required by the operating department. With the labor situation that prevails, and that is likely to continue for some months to come, these improvements in track and other facilities can be accomplished only through the use of efficient labor-saving devices.

As We See It

Fully cognizant of this fact, we feel, first, that it is necessary for us to set up in our annual budget sufficient money to replace old and obsolete equipment, based on the life expectancy of the different classes of equipment, and, in addition, to purchase such additional newly developed or improved types of equipment that we will always have reasonably modern machines. After the equipment has been purchased, we feel that it is highly important that its use be properly programmed, so that the maximum hours of use will be obtained from it. This is particularly true with respect to the heavy and more expensive types of equipment. Our general maintenance program for the year is made up in the office of the engineer maintenance of way as early in the spring as possible, and, with the former thought in mind, a copy of this program is furnished to the supervisor of work equipment as quickly as possible so that he can make out his schedule of necessary assignments of the equipment needed.

One of the most important factors in the effective use of work equipment, to which serious consideration must be given, is the training of maintenance of way men to become equipment conscious. Many among the maintenance forces, both supervisors and foremen, as well as laborers, are averse to the purchase and use of such equipment in the conduct of their work. This is particularly true in the case of small power tools, and calls for close supervision on the part of every officer in the maintenance of way department if we are to obtain the benefits that we should from our very considerable investment in this equipment.

Preventive maintenance, we believe, is one of the most important factors in getting the maximum hours of service out of any equipment. Such maintenance can be accomplished only by periodic servicing in the field, to prevent shopping. When this is done, many machines are kept in service instead of entailing expensive shop work, with subsequent loss of man-hours, both in the field and in the shop.

The situation with respect to labor is such that it is imperative that all maintenance of way personnel continue their study and interest in the development of new machines for doing maintenance work, as well as their search for new uses for the equipment that is already on hand. At present, many types of machines are designed for a single purpose, with the result that they are used only a small percentage of the time. It is our belief that the purchase of such equipment should be kept to a minimum, consistent with requirements.

We have felt for some time that the amount of money invested in roadway equipment, especially by small railroads, could be greatly reduced if someone would set up a company to rent this equipment. We have in mind, particularly, rail-laying equipment. At present, to take full advantage of machinery for rail laying, it is necessary to purchase spike pullers, adzers, spike drivers and other equipment which can be used only during rail-laying operations. If the rail tonnage to be laid is small, the number of days this equipment is used is, of course, very limited, with resultant heavy carrying charges for the equipment. If a company could be organized to provide the necessary equipment for a group of small roads on a rental basis, and thus not require a large capital investment on the part of the individual railroads, rail laying could be programmed properly to get a maximum number of days use of this equipment with the minimum investment.

Normally, we look to the manufacturers to make improvements in our equipment, but we should all take a keen interest in this matter, working with the various manufacturers; and when improvements have been found, and have proved themselves sound, we should take full advantage of them.

New Machines Needed

There is still great need for several new types of roadway machines, and we are looking forward to someone developing these machines. For example, there is need for an efficient ballast cleaning machine, designed and manufactured to sell at a reasonable price, so that roads can divorce themselves from dependence on contractors for this type of maintenance work. A machine to crib cemented ballast, particularly in connection with reballasting work, is needed badly. We understand that one supply company has recently developed such a machine, which appears to have great possibilities. This, indeed, should prove to be an important labor-saving device. Furthermore, there is need for a spike-setting machine for use in rail-laying operations, preferably with automatic or magazine feed, which will start spikes straight for driving with independent pneumatic spike drivers. The development of such machines, as well as many others, presents a challenge to both maintenance men and the manufacturers of equipment.

In general, it must be said that the maintenance of way departments of the railways have been backward in the adoption and use of machines for their work, compared with most mechanical departments. It is to be hoped that, in the interest of greater economy and efficiency in carrying out the large amount of maintenance of way work that must be done in the future, a more favorable situation in this regard will prevail.

One of the Gasoline-Operated Cranes Removing the Debris of the Collapsed Draw Tower

Fire Strikes B. & M. Machines Help S

In this article, the author tells how, for the second time in four years, an important four-track structure on the Boston Terminal division was severely damaged by fire, and then, having assisted in the reconstruction, gives an eyewitness account of how power tools and machines speeded the restoration of the bridge to service.

By F. R. SPOFFORD
Assistant Division Engineer
Boston & Maine, Dover, N. H.

THERE is an old saying that "lightning never strikes twice in the same place," but, at least insofar as fires are concerned, this adage was thoroughly discredited on the Boston & Maine recently as fire struck one of its more important bridges for a second time within a period of about four years. However, at the same time, the faith of the railroad in the value of power tools and heavy work equipment has been reaffirmed, as again it was the use of such tools and equipment that made possible the rapid restoration of the structure to serviceable condition.

The bridge involved in the "repeat" fires, which is known as Drawbridge No. 8, crosses the Mystic river at Boston, about two miles north of North station. This structure, with two main line tracks and two freight tracks, carries the greater part of the road's heavy through passenger and freight traffic between Boston and Portland, Me., as well as extremely heavy commuter traffic into and out of Boston daily, and considerable local freight service. Located within tidal water, a feature of the bridge is its jack-knife draw span, which was involved in both fires, and which will be referred to in more detail later.

The earlier of the two serious fires involving this important structure, together with the effective reconstruction at that time, were described in *Railway Engineering and Maintenance* for June, 1942. The more recent fire, which is the subject of this article, occurred on Sunday, November 4, 1945. On that date, at 3:45 a.m., the draw tender, having noticed the reflection of flames on the water, went down on the bridge to find the east approach trestle in flames. The fire spread so rapidly that, after returning to the draw tender's house and turning in an alarm, he had difficulty in reaching the shore safely.

Fire companies and apparatus from both Somerville and Medford, Mass., responded promptly to the alarm, but in spite of this and added fire protection which had been provided on the bridge following the earlier fire, the flames spread over the entire east approach trestle and through the draw span tower. As a result, the superstructure of the east approach was substantially destroyed and the draw tower collapsed across the tracks.

M. Bridge Again— elp Speed Reconstruction

Fortunately, the draw span was closed at the time, and, of steel construction, was not affected by the fire. The cause of the fire has not been determined.

Details of Construction

The draw tower, of timber construction, had been reconstructed with creosoted material throughout following its destruction in the earlier fire. This tower was essentially a heavily trussed gallows frame, extended to tower form to support the operating machinery of the draw span, and was braced and guyed extensively to support the loads and thrusts involved in opening the draw. The front legs of the tower consisted of four 12-in. by 12-in. timbers keyed and bolted together, while side braces supporting the tower consisted of single 16-in. by 16-in. timbers, the longest of which were 96 ft. in length.

The draw span itself, which was one of a very few of its kind in the country, consisted essentially of a series of parallel independent deck-type trusses, each supporting one track rail, which were hinged at the draw tower end, and which, as a group, folded back laterally to open the waterway. Operation of the draw was obtained by lifting the outer ends of the trusses supporting the rails by means of front guys, which extended from the top of the tower to needle-beams beneath the trusses. After the free ends of the trusses were lifted clear of their seats, a separate mechanism was employed to swing them laterally about their pivoted ends into a pocket provided in the fender pier alongside. In other words, the location of pivots, needle-beams and separators between the various trusses, in combination with the absence of any deck between the various trusses and rails, permitted the draw span to fold away laterally like a series of parallel rulers.

The approach trestle of the bridge consisted of 6-in. by 8-in. creosoted ties supported on two 10-in. by 16-in. creosoted timber stringers per rail. These stringers were of double-span length, arranged in the lap chord system called for in the recommended practice of the American Railway Engineering Association.

The bents of the approach trestle each consisted of 21 untreated oak piles supporting two 12-in. by 12-in. box caps of creosoted timber. These double caps were installed following the earlier fire to compensate for damage to the tops of the piles, and replaced two original 6-in. by 12-in. girder caps with a 6-in. by 16-in. flat rider cap. The piles were held in line in the bents by two 6-in. by 12-in. girts, located about 12 in. below the double caps, and the bents were braced laterally by cross bracing and low-water girts. There was no longitudinal bracing except in the approach spans immediately underneath and adjacent to the draw tower. However, these latter spans had an elaborate system of braces and struts to transmit to the piles the loads from the tower back guys and the back braces.

F. R. Spofford

Damage to the deck of the approach trestle and to the draw tower during the fire on November 4 last was much more severe than during the previous fire. In the latest fire, the tops of many of the piles were damaged to a considerably lower level than in the earlier fire, a fact which is attributed in part to the creosoted timber used in the earlier reconstruction work.

Upon inspection of the bridge as soon as control of the fire permitted, it was found that the piles beneath the freight track on the downstream or south side, known as the Boulevard track, had sustained the least damage. Although the tops of many of these piles had been greatly reduced in size, it was considered feasible to place new caps on them without

This View of the Bridge Was Taken During the Fire That Occurred About Four Years Ago

cutting them back to a lower level. Accordingly, it was decided to rebuild the structure temporarily on this side, opening it up to single-track operation at the earliest possible moment.

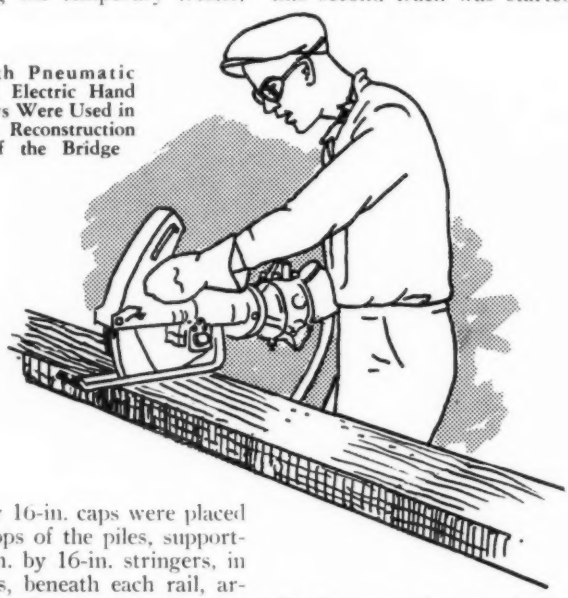
Immediately with this decision, all attention was turned to bringing together the necessary materials, equipment and men to speed the reconstruction work. Timber was loaded and forwarded from the stores department of the road at Nashua, N. H., and reached the site on the night of the day of the fire. Cranes and other equipment were assembled from the Terminal division and were also brought in from the other divisions. At the same time, carpenter crews, equipped with power and hand tools, were brought to the scene of the work.

As soon as the fire was declared out and some of the fire lines had been removed, which was about four hours after the fire was discovered, a start was made at clearing away the debris and wreckage, including the tangled remains of the draw tower. In this clearing work, the steel bottom chord of the front truss of the tower presented the greatest difficulty, and had to be removed by a wrecking crane working in conjunction with the carpenter crews. As soon as this member was out of the way, a 25-ton gasoline crane was put to work clearing away the damaged timber at the west end of the Boulevard track. At the same time, a 25-ton Diesel crane started similar work at the east end of this track, where it was found, to great advantage, that the crane could be run out on the adjacent track for about one-third the length of the trestle. However, it was evident that if the removal of the damaged deck had to wait until the cranes could work together from the ends, there would be considerable delay. Therefore, a 75-ton lighter was rented from a contractor who furnishes such equipment for wharf and dock work, to assist in the removal of the debris, and even though, because of shallow water, it could be used only for a few hours during high tide, it proved highly valuable in bringing about early completion of the temporary track.

Upon the removal of the deck beneath the Boulevard track, conditions were found to be much as expected from the inspection. Here, the tops of a few piles were so reduced in diameter that it was necessary to place lock blocks on them as a preparatory measure for the installation of the new caps.

The reconstruction work throughout was hampered by shortages of materials, especially timber, stocks of which had been seriously depleted during the war years. Fortunately, however, there was a supply of secondhand timber available, which had been salvaged from the retirement of piers and pier sheds at Boston. Nominally, much of this timber was 12 in. by 16 in., in 16-ft. lengths, but all dimensions varied considerably, which necessitated extreme vigilance and considerable extra work during the bridge reconstruction. Hardware was furnished from stocks of the road to start the work, but had to be supplemented by purchases from local manufacturers as the work progressed.

In building the temporary trestle, two 12-in. by 16-in. caps were placed flat on the tops of the piles, supporting two 12-in. by 16-in. stringers, in 16-ft. lengths, beneath each rail, arranged in the lap-chord layout for single-span stringers. New 6-in. by 8-in. ties were used with 2-in. by 8-in. planks spiked on them for spacers.



Both Pneumatic and Electric Hand Saws Were Used in the Reconstruction of the Bridge

While the temporary trestle construction was in progress, track forces installed crossovers to connect the two main-line tracks with the new single track across the bridge, and the signal forces connected up the signals so that all movements could be made on signal indication. Construction of the temporary trestle, the track changes, and the signal work, were completed so that traffic in both directions was resumed at 7:00 p.m., Monday, November 5. This was approximately 39 hours after the start of the fire; 35 hours after the fire was declared out; and 25 hours after the timber for construction was received at the site.

While the work of building the temporary trestle for single-track operation was in progress, a check by the stores department showed that there was only enough new timber available for the reconstruction of the bridge beneath one track, and that no additional new timber could be purchased. Therefore, except for the new timber available, the work had to be completed with secondhand timber similar to that used in the temporary trestle.

Preframe Timber

With the Boulevard track back in service, it was decided that the next track to be restored should be the eastbound (outward) main-line track immediately adjacent to the Boulevard track, as this would permit double-track operation with a minimum of track changes. Accordingly, work on this second track was started immediately upon the completion of the temporary single track, beginning with the stripping of the old deck. As this work got under way it was found that the tops of the piles in this location had been damaged extensively. However, it was determined that by cutting them off 24 in. below the old cut-off, good bearing could be obtained on all but a few of the piles, which had to be spliced.

In this location, short framed bents were placed on top of the old pile bents, these consisting of 12-in. by 12-in. creosoted sills and posts, and 12-in. by 12-in. CZC-treated caps. To facilitate placing the posts directly over the piles, these framed bents were built in place. This also permitted a stronger connection between the bents and the piles, since the sills could be securely drift-pinned to the piles before the posts were set on blind pins. To reduce and simplify the labor required to install these bents in their final locations, they were pre-framed at a point back from the bridge, and match-marked, so that the pieces, as dismantled, could be taken out onto the trestle for ready reassembling. Above the new short bents as installed, the deck of the

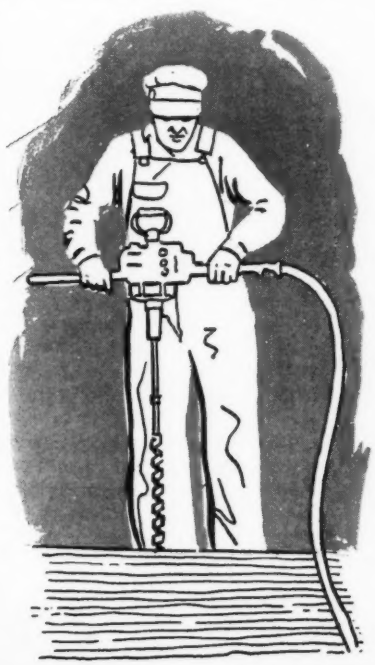
structure was rebuilt to the general standards that prevailed prior to the fire.

Work progressed rapidly in restoring this second track, which was ready for service by noon, Thursday, November 8. Then, with two tracks in operation, it was decided that no further changes in operation would be put into effect until the main lines could be restored to their normal locations.

To avoid interfering with traffic, it was decided next to rebuild the most northerly track of the bridge, known as the Medford track. When this was completed, it was used as a construction track during the rebuilding of the westbound (inward) track. Both of these latter tracks were completed, and traffic was restored to its normal location, on November 18. The temporary trestle first built was then removed and was replaced with permanent construction.

In the reconstruction of the last three tracks to be rebuilt, including the Boulevard track, secondhand timber, resawed, framed and treated at Nashua, was used throughout. Since the timber available for stringers was short, all of the stringers were arranged in a lap-chord layout for single-span stringers.

In view of the more rapid spread and greater destruction of the more recent fire, which was attributed in part to the creosoted timber employed in rebuilding the bridge following the earlier fire, careful consideration was given to the type of treatment to be used when rebuilding the bridge. As the result of this consideration, it was decided to use creosoted timber only within the tide range, including posts, sills and bracing, and to employ chromated zinc chloride treatment for all ties, tie spacers, stringers and top caps.



The Power Equipment Used Included Electric and Air-Operated Boring Machines

Draw Tower

With the completion of the work on the approach trestle, construction was started on the draw tower and in replacing the draw-span machinery. The tower was rebuilt substantially as before the fire, of timber, but this time the timber was given CZC treatment, instead of a creosote treatment. However, new machinery had to be designed and ordered, new guy cables and guy rods had to be purchased, and a new steel bottom chord had to be fabricated for the front truss of the tower.

Following the earlier fire in 1941, the timber agent of the Boston & Maine, with the approval of the vice-president, purchasing, had, as a safety measure, purchased sufficient timber for two draw towers—one set of timbers to be used at the time, and the other to be carefully stored for emergency use only. If this timber had not been available, there would have been great delay in opening the draw to river traffic. With it, work progressed steadily in rebuilding the tower, and while there were delays occasioned by severe winter weather and difficulties in obtaining certain materials, the tower was completed and the draw span opened for river traffic on February 4, 1946.

Equipment Speeded Work

Aside from the fortunate circumstance of having certain materials available, the rapid and successful progress of rebuilding Drawbridge 8 was due in large part to the extensive use of power equipment and tools by men who were experienced in their use. The equipment used was essentially of two types—track-mounted and off-track. The track-mounted equipment consisted of a variety of cranes normally used for handling materials, and including a regular wrecking crane in a work train which, as pointed out previously, was used to remove the steel bottom chord of the front truss of the drawbridge tower.

During the construction of the section of temporary trestle, six cranes were employed, three at each end of the section involved. On the east end, one 15-ton gasoline crane worked on the track under construction; a 25-ton Diesel crane unloaded material and brought it forward on the bridge; and a 15-ton gasoline crane handled track materials. On the west end, a 15-ton gasoline crane worked on the track under construction; a 25-ton gasoline crane unloaded material and brought it forward; and a 25-ton steam crane unloaded material and handled track materials. All six of these cranes worked continuously until the temporary trestle was completed, following which, only from two to four of the cranes were used, as required.

When the construction of the draw tower was started, the requirements for cranes changed radically and, because of the height of the tower, the cranes with 40-ft. booms, used in the earlier work, were no longer adequate. For the tower work, two steam cranes, each with 42-ft. booms extended to 72 ft. by the insertion of a center section, were employed—material being brought to them for erection, as required, by other cranes.

Provision for Adequate Illumination of the Night Work Was a Major Consideration

The off-track equipment employed in the rebuilding of the bridge varied widely in character. The largest unit was a lighter, rented for the occasion, as mentioned earlier. This consisted of a large scow carrying its own steam plant and hoisting engines, and equipped with an 80-ft. boom. As pointed out previously, this piece of equipment was used only for a few hours, but its availability for even this short time greatly advanced the work.

Since much of the work had to be carried on at night, the provision of adequate artificial illumination for the various operations was a major requisite. Accordingly, floodlights were installed at the ends of the bridge, and lines of lights were strung across the bridge at frequent intervals, providing general illumination. For greater concentration of light at points where the most intensive work was

(Continued on page 305)

Modern Organization Insure Adequate

With the rapid growth in ownership of roadway machines on the Northern Pacific within the last five or six years, this road has built up a highly effective organization for the routine inspection and maintenance of these machines, and, more recently, has constructed a modern shop at Livingston, Mont., to permit the most efficient repair and overhauling of this equipment on a system basis. This article discusses the work equipment maintenance set-up as now constituted, gives some idea of the present scope of mechanized roadway operations on the road, and describes in detail the new work equipment repair shop at Livingston.

DURING the last five or six years, stimulated by labor shortages and unusually heavy programs of roadway and structures maintenance as the result of war traffic, the Northern Pacific has made rapid strides in mechanizing its track and bridge and building forces, and has recently completed one of the most up-to-date work equipment repair shops in the country, at Livingston, Mont., equipped to handle efficiently the heavy maintenance and repair of the major part of the roadway machines on the system. In fact, the entire organization for the maintenance and repair of all such machines on the road is calculated to keep it in highly efficient working condition while in the field, with an off-season shopping schedule insofar as possible, especially for the seasonal equipment, so as to minimize interference with work operations.

Prior to 1939, the Northern Pacific, with 6,577 miles of line, and extending from St. Paul and Duluth, Minn., to Tacoma and Seattle, Wash., and Portland, Ore., handled its work equipment repairs at Brainerd, Minn., Livingston and South Tacoma, largely on a grand-division basis. Under that set-up, a stop at Brainerd handled equipment on the road west to Mandam, N.D., a distance of approximately 450 miles west from St. Paul; a shop at Livingston handled the equipment between Mandam and Paradise, Mont., a distance of 870 miles; and a shop at South Tacoma handled all equipment west of Paradise, a territory covering approximately 770 miles.

Mechanization Rapid

Until 1939 the principal work equipment on the Northern Pacific included motor cars and some of the larger units, such as cranes, ditchers and pile drivers, and a few crawler-mounted shovels, bulldozers, rail cranes and tie-tamping outfits. Since that year the road has mechanized practically all of its major track operations, including rail laying, ballasting, surfacing and weed burning, and has also purchased a considerable amount of off-track grading equipment. A list of its more important units of work equipment at the present time includes:

- 18 Locomotive cranes
- 12 Pile drivers
- 20 Crawler-tractor bulldozer and scraper outfits
- 8 Crawler-mounted combination shovel, dragline, cranes (1 to 1½ yd.)
- 13 Steam ditchers
- 1 Gasoline ditcher
- 17 Spreaders
- 4 Ditcher spreaders
- 11 Rail cranes
- 53 Four-tool tie-tamping outfits (pneumatic and electric)
- 34 Eight-tool tie-tamping outfits (pneumatic)
- 12 Single-unit tie tampers
- 1 Twenty-four-tool, truck-mounted tie tamping outfit
- 2 Power ballasters
- 1 Power cribber
- 8 Ballast drainage cars
- 3 Gasoline-engine-driven hoists
- 20 On-track weed mowers
- 24 Off-track, rubber-tired tractor mowers
- 14 On-track weed burners
- 14 Weed burner water car outfits
- 8 Power jacks
- 8 Portable rail layers
- 1 Track shifter
- 19 Power adzers
- 38 Power track wrenches
- 8 Portable frog and switch-point grinders
- 21 Power rail saws
- 21 Power rail drills
- 14 Mechanical spike pullers
- 4 Power spike drivers
- 6 Tie cutters

Approximately 1,200 motor cars

- 24 Automobile trucks
- 20 Concrete mixers
- 4 Fire-guard discers
- 2 Portable chemical weed sprayers

Repairs Under Mechanical Department

Under the earlier arrangement, all major work equipment repairs on the Northern Pacific were carried out by mechanical department forces at the three shop points already mentioned, utilizing such building space as might

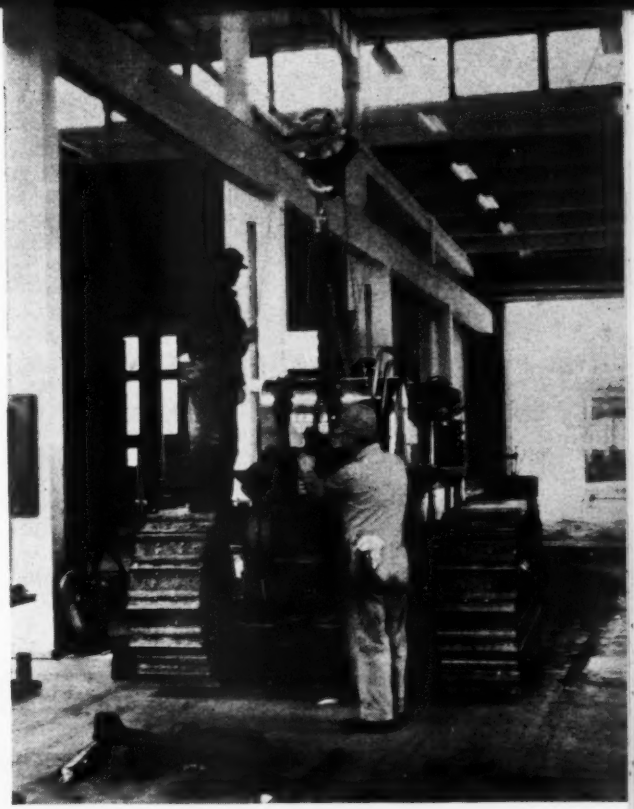
The West, or Main, Entrance to the New Work Equipment Repair Shop. New Locomotive Shop Extension in the Background

and *System* Shop Equipment Repairs on NORTHERN PACIFIC

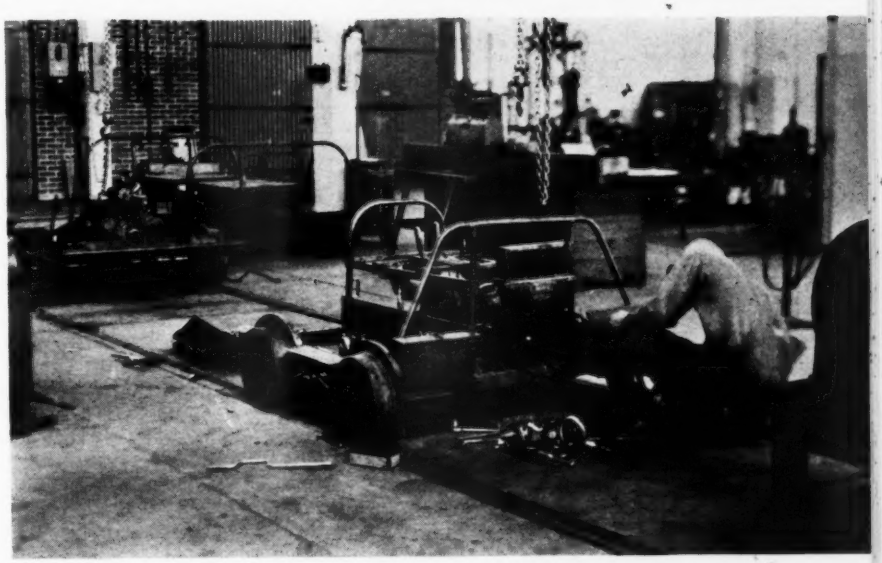
be available. All major work equipment repairs are still handled by the mechanical department forces, with the co-operation of the store department, but in 1942, with the steady enlargement of work equipment ownership by the road, the present set-up, involving a new system repair shop at Livingston, was put into effect. At that time, however, and until the completion of the new system shop, repair operations were scattered about in available shop areas at Livingston, with the larger part of it being concentrated in the car repair shop and the locomotive erecting shop—both old buildings, and both of which had become increasingly crowded by the added work on locomotives and rolling stock required by war traffic. In fact, to meet the need for larger locomotive repair facilities, the locomotive shop at Livingston was more than doubled in size during 1944.

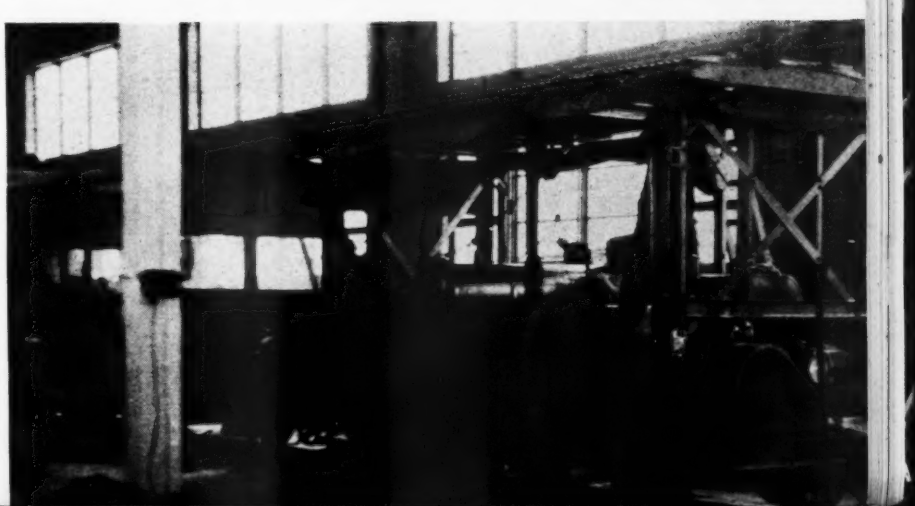
Work Now Concentrated

In conjunction with this and other shop improvements at Livingston the new maintenance of way work equipment repair shop was built, relieving other buildings of this class of work, and, for the most part, concentrating it under one roof in the hands of a separate, specially skilled organization. The exception to the general rule in this regard is the repair of the larger units of equipment, such as steam and gasoline-engine-powered ditchers, locomotive cranes and pile drivers, spreaders, etc., which is still done in the old locomotive shop, now relieved of much of its locomotive work by the new locomotive shop extension. However, of the total number of these larger units on the road,



Right—Working on a Tractor in the Tractor Bay, With the Aid of One of the Traveling Cranes in the Shop. Below—In the Area Where Motor Car Repairs Are Made





Another View in the Shop Showing a Large Weed Burner Undergoing Repairs Over the Engine Pit

only five of the power ditchers, four of the locomotive cranes, three of the pile drivers, and eight of the spreaders, are repaired at Livingston, the remainder being taken care of periodically at Brainerd and South Tacoma.

Maintenance Department's Part

From the standpoint of the maintenance of way department, the operation, maintenance and repair of all work equipment is handled under the general direction of a supervisor of work equipment, who has the following organization: One assistant supervisor of work equipment, one foreman of roadway equipment, one inspector of work equipment, and three traveling roadway work equipment mechanics.

In this organization, the assistant supervisor of work equipment shares the overall duties of the supervisor of work equipment, as assigned. The foreman of roadway equipment, with headquarters at Livingston, is a system man, whose principal responsibility is the heavier units of equipment, such as ditchers, shovels, spreaders, power tractors, etc. This man makes periodic inspections of all of these units on the road and, when anything goes wrong, arranges for repairs, sometimes making these repairs himself or with the operator, or one of the traveling mechanics.

The inspector of work equipment is stationed at the new maintenance of way work equipment shop at Livingston and, in general, is the direct representative of the supervisor of work equipment with the store department and the mechanical department forces operating the shop. In his capacity as inspector, he checks all machines inbound for repairs with a representative from the store department, and inventories parts, supplies, etc., in tool cars assigned to the large units, to make certain that they are complete as received. He also checks outbound machines, repaired and going back into service, to be sure they are supplied with the necessary accessories.

The three traveling mechanics operate on a grand-division basis and each is equipped with a one-ton panel-body truck, by means of which he keeps in constant touch with all equipment on his district. Continually on the road, these field men cover their respective territories about every three weeks, visit every machine, check its operation with the operator, and make such adjustments or running repairs as may be necessary. Essentially, their work may be classed as "preventive maintenance," although they make repairs up to the point where the condition of the machine is such that it should be sent to the shop.

These men, all of whom are qualified welders, keep tied in closely with the roadmasters on the different territories and can be reached either directly through them or through the supervisor of work equipment. With them in their trucks, they carry a complete set of mechanic's tools, welding apparatus, portable power-driven drills and grinders, electric test meters for 6.12 and 110-volt current, test ammeters, test gages, tachometers, etc. They also carry a considerable stock of those engine and machine parts that have been found most generally needed because of wear or breakage.

In general, these mechanics have little to do with track motor cars, the major exception in this regard being emergency work on heavy-duty gang cars. This is primarily because time will not permit their taking on this class of work and still allow them time to give proper attention to all of the other equipment under their care.

Motor Car Maintenance

Motor car maintenance is handled largely on a grand-division basis, with general repairs and overhauling being done at one of the three mechanical department shops—Brainerd, Livingston or South Tacoma. If field repairs must be made to a car beyond the ability of the foreman or other operator in charge of the car, and no mechanic is available or the car is not close to a local division shop, the car is sent into the appropriate shop and a relief car is furnished. To permit this replacement of cars sent in for repairs, the road maintains a number of spare cars of various types, usually at division or subdivision points. Foremen or other operators are not expected to do work on motor cars or other equipment beyond minor adjustments, although in large mechanized gangs, such as are used for rail laying or for ballasting and surfacing, an extra, specially-qualified operator is frequently assigned to the work to keep the equipment in good condition.

Geographical conditions over the system have an important bearing on the operation of the new system work equipment repair shop at Livingston. On the eastern half of the railroad, where the use of roadway equipment is largely on a seasonal basis because of generally severe winter conditions, most of the equipment automatically goes to the shop with the close of the working season and is given early winter attention by the shop forces. On the western half of the road, where all-year roadway operations are permitted by the more open winters generally prevailing, the equipment is not sent to the shop until late in the winter, when most of the east-end equipment has been repaired or otherwise put in condition. Then, to a large extent, the east-end equipment is sent to the western half of the road as replacements, and the former west-end equipment, when repaired by early spring, is sent to gang organizations on the east end of the road.

Thus, much of the work equipment

General View Taken Within the New Work Equipment Repair Shop, Showing General Features of Construction

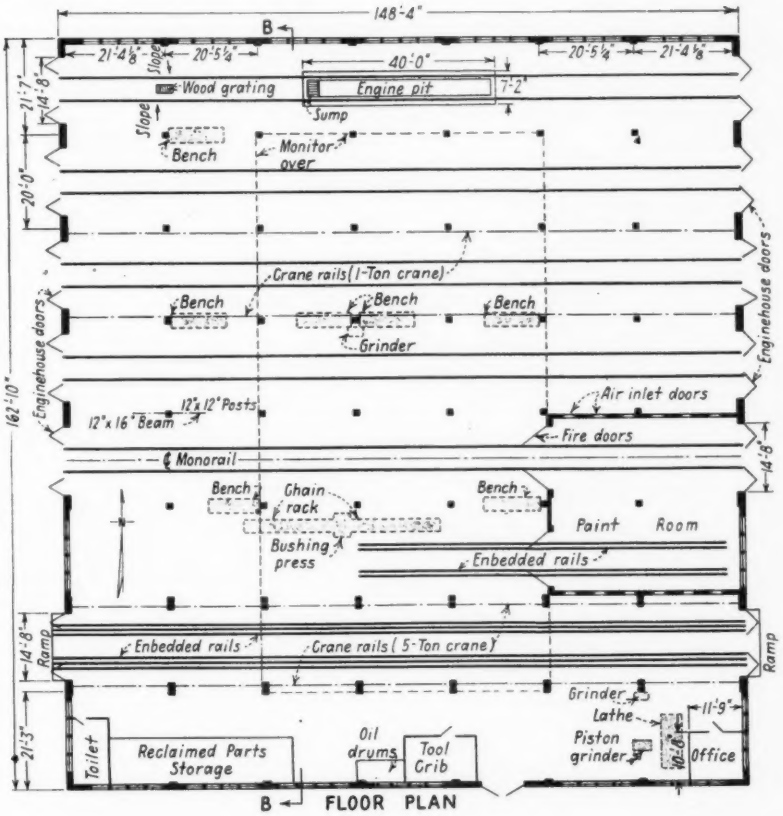
on the Northern Pacific passes from eastern gangs to western gangs, and vice versa, in alternate years, keeping those gangs on the west half of the road equipped through all seasons, while the requirements of those gangs on the east half of the road are met adequately throughout their working season. As repaired, and until sent out to the road forces, the equipment is stored under cover.

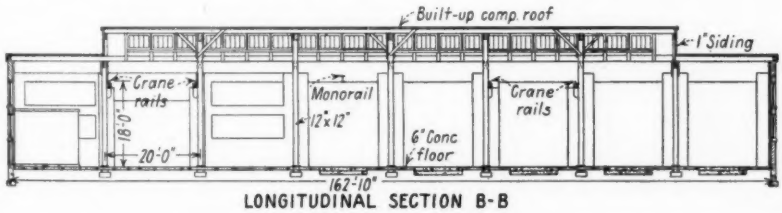
Modern Repair Shop

The new system work equipment repair shop at Livingston, of modern, fire-proof construction throughout, incorporates a number of features designed to facilitate repair operations under the most favorable conditions, and allows in size for further expansion in the amount of work equipment on the road and consequent shop operations.

In general, the building is located in a north and south direction, directly opposite the new locomotive erecting shop extension, where it is served by the transfer table serving the locomotive shop. It is one story high, rectangular in plan, 163 ft. long parallel with the transfer table, and 150 ft. wide.

Influenced in its design by the difficulties in securing structural steel at the time it was built, the shop has common red brick walls, and a timber roof structure throughout, supported on parallel rows of 12-in. by 12-in.





Above—General Floor Plan of the Shop, Showing Arrangement of Tracks and Equipment. Below—Longitudinal Cross Section Through the Shop

timber columns, which divide it into eight transverse bays, east and west, all of which are 20 ft. wide, except the end bays, each of which is approximately 21 ft. wide. Crosswise of the building the column spacing is 20 ft. 5¼ in., except immediately adjacent to the east and west walls, where it is 23 ft. Extending east and west through five of the transverse bays are five repair tracks, as will be mentioned in more detail later.

The roof of the shop, which is generally flat, and at an elevation about 22 ft. above the floor level at the eave lines, has a low central monitor which covers about one-third of its area. This rise in the roof is of frame construction, with closed-in faces on its north and south ends, but with clear-glazed fixed and ventilating wood sash continuously along the east and west sides. Overall, the roof deck is covered with built-up composition roofing.

All exterior walls, as mentioned previously, are of common red brick, are supported on concrete foundations, and have reinforced brick lintels. The north and south walls are each fitted with large areas of wood sash, glazed with clear glass, in two almost continuous panels 5 ft. 2 in. high, one above the other, while the east and west walls, providing entrances for the five repair tracks and a driveway serving the shop, are each broken by a series of six four-section, vertically-hinged, folding doors each 18 ft. high and affording a clear horizontal opening of 14 ft. These doors, which are of a type used generally on the road for shop and enginehouses, are of wood construction, three panels high, the two upper panels in each case being equipped with clear glazed sash to enhance daylighting of the building interior.

Special Features

The five tracks serving the shop extend from a new ladder-track layout west of the building, which provides for the holding of a large amount of track-mounted equipment awaiting repairs. Each of the repair tracks occupies one of the transverse bays in the shop, and extends continuously through the building to the locomotive erecting shop transfer table directly to the east. With five of the eight transverse bays in the shop occupied by repair tracks, the remaining three have unobstructed floor areas and are assigned classes of work which do not involve track-mounted equipment.

The floor construction throughout is of concrete, 6 in. thick, flush with the tops of the track rails, and all tracks are supported on continuous 8-in. concrete foundation slabs. All floor areas were given a specially hardened, dust-proof wearing surface, and, in addition, within one of the bays assigned to crawler-tractor repairs, six lines of secondhand track

rails were embedded in the concrete, with three lines longitudinally beneath each line of tractor treads, and their heads flush with the floor-surface, to absorb any tractor shoe wear.

As for the crawler-tractor work, the remainder of the shop has assigned areas for practically all other classes of work, which are specially equipped for the types of work to be carried out. Hoisting equipment within the shop includes two 5-ton overhead traveling cranes serving the tractor repair bay, a 1-ton and a 2-ton overhead traveling crane serving the bay where much of the motor car work is concentrated, and an overhead monorail serving a third bay where a variety of lighter work is carried out.

Other Features

Other features of the shop include a 40-ft. concrete inspection and repair pit at about the mid point of the track in the most northerly bay; a washing rack, with a grating-covered sump, in the same bay, immediately west of the track pit; the interior finish of the shop, which is painted white throughout to improve appearance and to enhance both day and night illumination; a shop foreman's office; adequate toilet and washroom facilities; a specially ventilated and lighted paint-spraying room; fluorescent lighting throughout the main shop areas; forced-circulation heating by means of a series of 12 roof-supported unit heaters; and an exhaust-gas collecting and discharge system, which makes it possible to run work equipment engines anywhere within the building while being repaired or tested, with a minimum of escaping fumes into the atmosphere.

The paint-spraying room, which occupies an area about 40 ft. long by 40 ft. wide along the east side of the shop, is fully enclosed by brick walls, except for door and ventilator openings. One track extends through the room to permit the movement of track-mounted equipment into and out of it, and the openings for this track are fitted with large equipment doors in both the inside and outside walls. A smaller door alongside on the inner face of the room provides for the entrance of all other equipment to be painted.

Artificial lighting within the painting room is by means of 20 ceiling-hung explosion-proof electric lights, while ventilation is by means of a roof exhaust fan with a capacity of 30,000 cu. ft. of air per minute. To provide for this volume of exhaust, each of the side walls of the painting room is equipped near the floor level with a series of six ventilating openings. Each of these openings, approximately three feet square, is fitted with a vertical-sliding, counterweighted door, which can be raised and lowered by hand to produce the ventilation desired. In practice, the main door entrances to the room are closed during painting operations, and only those wall ventilating openings nearest the painting operations are uncovered at any one time. The effect of this is to cause a draft of fresh air to pass from the uncovered openings directly over the work, and then upward to the roof exhaust.

Lighting throughout the repair shop proper is entirely by fluorescent lights, supported either directly from the underside of the roof, or suspended from steel messenger cables beneath the monitor area. Altogether, there are a total of 205 fluorescent lighting fixtures within the shop, generally arranged in two parallel lines down through each transverse bay. All of the fixtures have three 40-watt fluorescent tubes, which, in combination with their arrangement, provide a lighting intensity of approximately 25 foot-candles at the floor level.

The exhaust gas ventilating system generally throughout the shop consists of an overhead collecting system of ducts, equipped with 4-in. sheet metal pipe drops at alternate columns in each transverse row of columns, which extend down to a point about 12 in. from the floor level. Each of the vertical pipes is fitted at its lower end with a flared metal collecting hood, and each is also equipped with a push and pull shut-off slide.

Providing the forced exhaust, the system has a large-capacity exhaust fan at the roof level, which can draw off floor vapors either locally or generally throughout the shop, governed only by the positions of the valve slides in the individual exhaust drops. Normally, it is the practice to open only those exhaust drops directly about any area in which engines may be running, and when any prolonged engine operation is required, a flexible tube is extended directly from the engine exhaust pipe to the flared bottom of one of the ventilating drops.

Large Volume of Work Handled

From the standpoint of efficiency in carrying out the wide variety of work called for, another feature of the new shop is the special tools and equipment provided, and the adequacy of repair parts kept on hand to avoid delays in making repairs or replacements. Some of the more important tools provided at the shop include 2 power lathes, a piston grinder, a drill press, a cylinder borer, ignition testing apparatus, valve grinders, paint spray equipment, and work benches scattered about at strategic points, each equipped with appropriate bench tools. Certain other mechanical equipment is readily available to the shop forces, as required, located in the nearby car and locomotive shops, including a metal-spraying machine for rebuilding worn parts, and grinders for refinishing the rebuilt parts, which are located in the old locomotive shop.

Still another feature of the new equipment repair shop, in the interest of adequacy and efficiency, is the fact that it is piped throughout with compressed air, oxygen and acteylene, with outlets at frequent intervals for the air and for carrying out welding and cutting work. The air is furnished by compressors located in the power house serving the locomotive shop and other mechanical department facilities at this point, which was completely rebuilt in the recent improvements, while the acetylene and oxygen are piped from a new central oxy-acetylene building serving the shops.

Many small and inexpensive equipment parts are kept on hand in suitable bins and racks directly at the shop, but the main storage of work equipment parts and supplies is housed in one of the two large general stores buildings of the road at Livingston, maintained primarily in connection with the locomotive and car department shops at that point.

As mentioned previously, all operations at the work equipment shop are carried out by mechanical department employees, but in each case the men are assigned steadily to maintenance of way work equipment repairs. The size of the force employed in the shop varies, but normally includes a foreman, 17 machinists and 5 helpers. Some indication of the volume of work handled by this force is seen in the number of units of equipment that have been overhauled monthly to date, which has ranged from approximately 50 to more than 70, depending on various factors.

The designing and construction of the work equipment shop were done under contract by the Seattle office of the Austin Company, engineers and builders, of Cleveland, Ohio, under the direction of the engineering department of the Northern Pacific in collaboration with its mechanical department. The handling of maintenance equipment on the road is under the direction of the engineering department, and immediate supervision over all such equipment is in the hands of S. H. Knight, supervisor of work equipment at St. Paul. All shop operations at Livingston are under the general direction of the mechanical department, and under the direct supervision of W. D. Gochenour, shop superintendent at Livingston.

C. & O. Track Awards

DURING 1945 the Chesapeake & Ohio continued its practice of making track inspections with a special mechanical-recording inspection car for the purpose of granting awards to foremen and supervisors for excellence in track maintenance. Because of the continued necessity for conserving motive power and passenger equipment, however, and following the precedent of the last three years, the practice of operating a special inspection train was again abandoned and a record of the track condition was obtained by attaching the special inspection car to various regular trains. Although it was reasonable to assume that after four years' curtailment in the supply of track materials and a shortage of manpower, a certain amount of physical deterioration would be apparent in the track, the inspection showed a minimum falling-off in its riding quality, indicating a high degree of perseverance and resourcefulness on the part of those in charge of roadway and track maintenance over these years.

To judge the different territories on a comparative basis, they are classified into five basic groups, according to character of track and traffic. These are: Group 1—Double-track main lines, both freight and passenger; Group II—Single and double-track main lines, principally freight; Group III—Single-track main lines, principally passenger; Group IV—Secondary branch lines; and Group V—Yard and terminal territories. Awards were made on the basis of grades established by the annual fall inspection.

In Groups I and II, prizes of $50, $40 and $30, respectively, were awarded to supervisors receiving the first, second and third highest ratings, and in Groups III and V prizes of $50 and $40, respectively, were awarded for first and second highest ratings. Prizes of $25 and $15, respectively, were awarded to section foremen for the first and second best-maintained sections on each supervisor's territory. Prizes of $50 each were also awarded to the supervisors in Groups I and II, and to the supervisors in Groups III and V, whose territories showed the greatest relative improvement compared with the previous year. Again, this year, no inspection was made of Group IV, secondary branch lines, but prizes were awarded two sections on each district on these lines, based on the recommendations of local officers. The names of the winning supervisors are as follows:

Group I—1st prize—G. C. Coyner, Ohio River district, Cincinnati division; 2nd prize—J. H. Poindexter, Peninsula district, Richmond division; and 3rd prize—J. Broshears, Northern district of the Cincinnati division.

Group II—1st prize—H. S. Chandler, Rivanna district, Richmond division; 2nd prize—O. L. Nelson, Paintsville district, Ashland division; and 3rd prize—Bert Allen, Martin district, Ashland division.

Group III—1st prize—G. E. Bostic, Mountain district, Clifton Forge division; and 2nd prize—J. E. Stennett, Piedmont district, Richmond division.

Group V—1st prize—L. H. Lucas, Maumee district, Hocking division; and 2nd prize—F. C. Cunningham, Russell division.

B. Johnson, supervisor of the Logan district, Huntington division, was awarded the improvement prize for Groups I and II, and G. E. Bostic, first-prize winner in Group III, was also awarded the improvement prize for Groups III and V.

Machines Speed Bridge Reconstruction

(Continued from page 299)

going on, cargo lights and cluster lights were used as needed. Power for these lights was furnished by portable tie-tamper electric generator units, which also provided power for the operation of electric tools.

During the construction of the temporary trestle, staging and walkways were kept to a minimum so that maximum effort could be applied to the actual reconstruction of the trestle itself. Since, under these conditions, the handling of air hose would have been difficult, and to some extent dangerous, electric tools were used in the early work, these including several makes and sizes of electric drills for boring timbers, and electric circular saws for cutting planks and boards. These tools, together with the portable generators powering them, were part of the regular equipment of the carpenter crews.

After the construction of the first track, pneumatic boring machines and air saws were also used, power for these being provided by a 160-cu. ft. trailer-mounted, portable compressor. Extensive use was also made to advantage of self-contained, gasoline-driven chain saws for cutting piles and timber, although their use required more staging than hand sawing.

The greater part of the equipment and tools used on the work was regularly assigned to the Terminal division. However, the equipment included a considerable number of units from other divisions and from the work equipment department. To keep the equipment in good condition, and to provide for prompt adjustments and repairs when needed, maintainers from the work equipment department were assigned to the job, under the direction of C. L. Fero, supervisor of work equipment.

Company Forces Throughout

All of the reconstruction work was carried out by the regular bridge and building forces of the road, the force doing the work beneath the first two tracks including 11 carpenter crews from the Terminal division, supplemented during one day by 2 crews from the Portland division. Crane engineers were drawn from all parts of the railroad to provide continuous crane operation, some of these men taking up a 12-hour shift on arrival at the job, after having completed their regular day's work. One problem in the operation of the cranes was presented by the shortage of trainmen necessary to protect their movements. However, through the personal attention and interest of the Terminal division superintendent and his staff, this difficulty was largely overcome, preventing delays to the work that would otherwise have occurred.

The entire project of rebuilding the bridge was under the general direction of T. G. Sughrue, chief engineer of the Boston & Maine; H. F. Fifield, engineer maintenance of way; J. P. Muller, engineer of signals and telegraph, and H. S. Ashley, engineer of track—Mr. Ashley also assisting in direct supervision of the work during the first few days. Direct supervision of the project was handled by R. H. Mitchell, division engineer, and F. T. Flynn, assistant division engineer, who were aided in their work by J. J. Winn, supervisor bridges and buildings; J. F. Talbot, track supervisor, and a number of their assistants. During the emergency period, these men were also assisted by the writer, who was formerly bridge and building supervisor on the Terminal division, and by J. W. Gannon, bridge and building supervisor on the New Hampshire division.

A.R.E.A. to Hold Its

Our Readers Are Invited by President Miller to Attend Three-Day Session at Chicago on March 12-14. He Gives Convincing Reasons Why the Meeting is Expected to Be Particularly Valuable

American Railway Engineering Association

90 EAST VAN BUREN STREET
CHICAGO 5

March 1, 1946

To the Readers of
Railway Engineering and Maintenance

As announced previously in the pages of this publication and in the various releases of the association itself, the American Railway Engineering Association will hold its annual meeting on March 12—14, at the Palmer House, Chicago, and I welcome this opportunity to invite you to attend.

The importance of this meeting, I am sure you will agree, is beyond doubt, and especially since war conditions made it inadvisable to hold such a meeting last year. Happily the war is over victoriously, but we must now get down diligently to the difficult railway problems of the intensive era that lies ahead — an era that will challenge the ingenuity and ability of every engineering and maintenance officer on the railways.

Our meeting will be particularly valuable this year because it will afford the first opportunity in two years for the oral discussion of committee reports. Furthermore, it will permit a first-hand presentation of the accumulated results of the research work in which the Association of American Railroads has invested a large amount of money, and which includes some projects which have not been discussed previously at an A.R.E.A. convention. In addition, it will present the first opportunity that you and other railway engineers and maintenance men have had for a long time to exchange ideas first-hand regarding your problems of the post-war period, including improvements in facilities, materials, methods and practices — the importance of which are only now beginning to be realized.

I hope that you will consider this a personal invitation to meet with us on March 12—14, if you can possibly do so, and that you will make a special effort to be present at those sessions at which subjects most closely related to your work will be considered. If you need hotel accommodations, write directly and promptly to the Chicago Convention Bureau, 33 N. LaSalle St., Chicago 2, which is arranging room space for all those who plan to attend our meeting.

Yours sincerely,

A. A. Miller, President

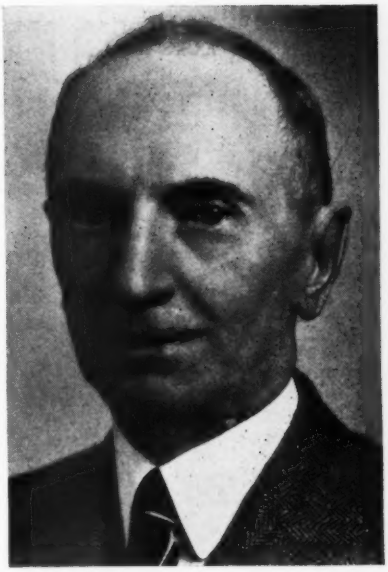
HAVING distinguished themselves in overcoming the difficult war-time problems imposed upon them, engineering and maintenance of way and structures officers of the railways of the United States and Canada will meet at Chicago, March 12-14, under the auspices of the American Railway Engineering Association, to consider a wide range of committee reports and addresses dealing with many of the pressing problems confronting them as the new era in transportation begins to unfold. With this gathering, the association will resume the practice of holding annual meetings, which was interrupted twice during the war, first in 1943 and again in 1945, when the annual meetings were cancelled because of the emergency conditions prevailing. As in past years the meeting will be held in the Grand Ballroom of the Palmer House.

In accordance with the usual practice the backbone of the three-day session will be formed by reports of 19 committees of the association on a total of 86 subjects covering a wide range of problems confronting engineering and maintenance officers. Supplementing these, there will be a number of addresses dealing with a variety of subjects of special interest at this time. The opening session on Tuesday morning, in addition to the address of the president and the reports of the secretary and the treasurer, will be featured by addresses by C. E. Johnston, chairman, Western Association of Railway Executives, by E. W. Reich, chairman, Signal section, A.A.R., and by J. M. Trissal, chairman, Electrical section, A.A.R.

During the afternoon session on Tuesday there will be two addresses, each keyed to one of the committee reports that will be presented during that session. Specifically, the report of the Committee on Co-Operative Relations With Universities will be followed by an address by Henry T. Heald, president, Illinois Technological Institute, and later during the same session, the report of the Committee on Highways will be followed by an address by J. R. Tenney, chairman, Committee on Highway Crossings, Safety section, A.A.R., whose subject will be: A Campaign for Caution at Highway Crossings.

On Tuesday evening the A.R.E.A. group will be invited to attend a meeting of the Western Society of Engineers at which O. M. Stevens, formerly chief, United States Railway Mission to Mexico, will discuss Lessons to be Learned from the

Its First Post-War Meeting



A. A. Miller
President, A.R.E.A.

Government Operation of Railways in Mexico.

During the morning session on Wednesday, following presentation of the report of the Committee on Roadway and Ballast, an address on the subject, Soil Mechanics as Applied to Railroad Roadbeds, will be presented by Prof. Ralph B. Peck, University of Illinois. At noon on Wednesday those in attendance at the convention will meet at a luncheon which will be featured by an address by Brig. Gen. Donald Armstrong, Commanding Officer, War Industrial College, Washington, D.C.

On Thursday morning, another address, keyed to the report of the Committee on Iron and Steel Structures, will deal with the Fatigue Strength of Structural Welds and will be presented by Professor W. M. Wilson of the University of Illinois.

The regular sessions of the meeting will be presided over by A. A. Miller, president of the association, and chief engineer maintenance of way and structures of the Missouri Pacific, assisted by Vice-President J. B. Akers, chief engineer of the Southern. Reproduced on the opposite page is a letter from Mr. Miller extending a special invitation to the readers of *Railway Engineering and Maintenance* to attend the meeting.

Program

Tuesday, March 12

MORNING SESSION—9:45 A.M.

Meeting called to order
Address by President Miller
Reports of Secretary and Treasurer
Address by C. E. Johnston, chairman, Western Association of Railway Executives
Address by E. W. Reich, chairman, Signal section, A.A.R.
Address by J. M. Trissal, chairman, Electrical section, A.A.R.
Presentation of Honorary Memberships.

AFTERNOON SESSION—2:00 P.M.

Report of Committee on Co-Operative Relations with Universities
Address by Henry T. Heald, president, Illinois Technological Institute
Reports of Committees on
- Economics of Railway Location and Operation
- Yards and Terminals
- Water Service
- Highways

Address—A Campaign for Caution at Highway Crossings, by J. R. Tenney, chairman, Committee on Highway Crossings, Safety section, A.A.R., superintendent of safety, Western Maryland
Report of Committee on Buildings

TUESDAY EVENING—7:00 P.M.

Address—Lessons From the Government-Owned Railways of Mexico, by O. M. Stevens, president and general manager, American Refrigerator Transit Company, St. Louis, Mo., and formerly chief, United States Railway Mission to Mexico

Wednesday, March 13

MORNING SESSION—9:00 A.M.

Report of Committees on
- Maintenance of Way Work Equipment
- Roadway and Ballast

Address on Soil Mechanics as Applied to Railroad Roadbeds, by Professor Ralph B. Peck, research assistant professor of soil mechanics, University of Illinois
Reports of Committees on
- Ties
- Wood Preservation
- Waterways and Harbors

ASSOCIATION LUNCHEON, 12:00 NOON

Address by Brigadier-General Donald Armstrong, commanding officer, War Industrial College, Washington, D. C.

AFTERNOON SESSION—2:30 P.M.

Reports of Committees on
- Rail
- Track
- Economics of Railway Labor

Thursday, March 14

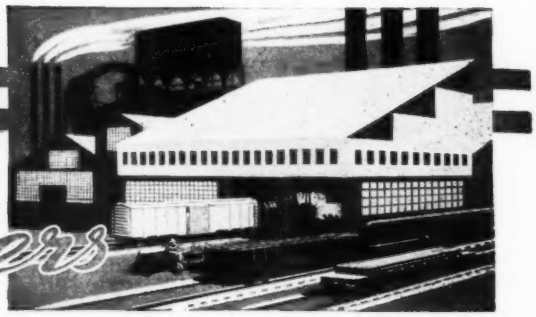
MORNING SESSION—9:00 A.M.

Reports of Committees on
- Wood Bridges and Trestles
- Masonry
- Iron and Steel Structures

Address on the Fatigue Strength of Structural Welds, by Professor W. M. Wilson, University of Illinois
Reports of Committees on
- Waterproofing
- Impact
- Records and Accounts

New Business
Installation of Officers
Adjournment

PRODUCTS of Manufacturers



Homelite Generators

AN extensive new line of portable generators has been introduced by the Homelite Corporation, Port Chester, N.Y. The new line comprises a total of 29 models ranging from 500 watts to 5,000 watts capacity and with current characteristics to meet almost any requirement. The line includes 17 direct-current models, five of which are compound wound 120-volt units, and 12 shunt-wound machines with voltages ranging from 22-30 to 130-160. There are 12 alternating-current generators, of which 8 are 60-cycle single-phase units, with 6 producing current at 115 volts and 2 115-230 volts. Four of the alternating-current power plants produce current at 230 volts, two of these being three-phase 60-cycle generators and two three-phase, 180-cycle machines.

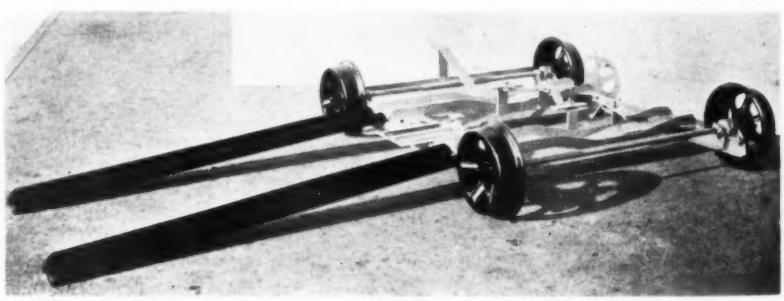
One of the New Homelite Generators in Use on a Construction Job

The new line of generators incorporates many features of design developed during a war-time program of building many Homelites for the armed forces. They include the use of aluminum alloys for all major castings, making possible a lower ratio of weight to horsepower. Single-cylinder, air-cooled, two-cycle engines are used on all models except those with 5,000-watt generators, which have two-cylinder, horizontal-opposed, two-cycle air-cooled engines.

Other features include a built-in governor controlling the speed of the engine, and a pressure-vapor oiling system, which sprays a film of oil over all moving parts of the engine at each revolution. Wico magnetos are used on the 1800, 2000, and 2500-watt units and Scintilla magnetos on all others. Each generator is direct-connected to the engine, with the armature being mounted on the crankshaft.

Compressor Trailer

AS a result of recent improvements, the compressor trailer manufactured by Fairmont Railway Motors, Inc., Fairmont, Minn., is now adjustable to permit it to be used for transporting four different types of two-wheel off-track air compressors or generators. Mounted on four flanged wheels, the trailer frame is constructed of steel members bolted together and embodies transverse channels for accommodating the unit to be carried. The spacing of these channels can be adjusted as necessary to accommodate the Ingersoll-Rand Model DR-60 compressor, the Worthington Model 65 compressor, and the Chicago Pneumatic compressor of comparable size, as well as the Syntron two-wheel-mounted electric generator. Ramps formed of steel channels are provided for loading and unloading the machines, and in position, the machines are held securely by clamps fitted with wing nuts which can be tightened without the use of wrenches. The improved trailer, known as Class T-18, Series A, is also adapted for handling other portable two-wheel machines with mountings similar to those for which it was designed.



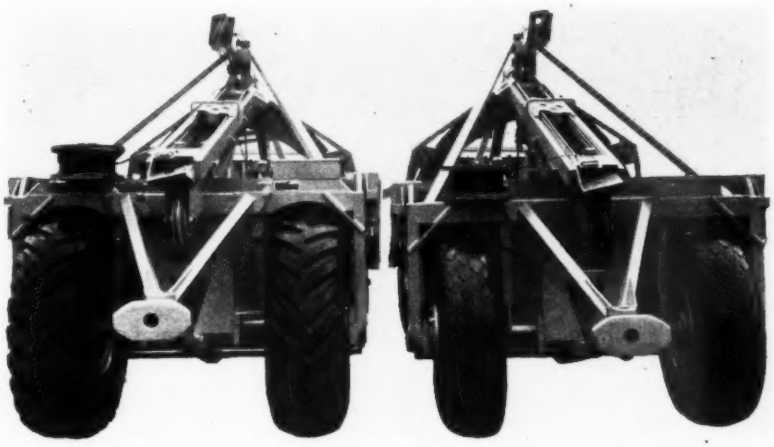
The Improved Compressor Trailer With Loading Ramps in Position

Larger Scraper Tires

R. G. LE TOURNEAU, Inc., Peoria, Ill., has announced that its Tournapull-drawn Carryall scrapers are now equipped with 21.00 by 24 tires instead of the 18.00 by 24 tires formerly used on these units. Although the former tires were considered adequate, the use of the new larger tires is said to have resulted in many added advantages. It is claimed that maximum loads can now be transported with lower pressure in the tires. Although the increased load capacity of the tires does not affect the gross loads carried by the scrapers, it does materially affect the performance in off-the-road operations. With lower pressures in the tires, it is said that flotation is increased and rolling resistance reduced, resulting in better and faster loading, hauling and spreading. The flotation contact area of the new tires is 24 per cent greater than of the smaller tires at rated pressures of 40 and 50 lb. per sq. in., respectively.

The change to large tires has increased the scraper clearance approximately four inches over that obtained with the smaller tires. This additional clearance is said to be advantageous in loading and spreading, as the increase in rolling radius plus the reduced pressure tends to buoy up the Carryall. With the scrapers equipped with 21.00 by 24 tires, it is said that the Tournapulls can travel in higher gear over a wider range of adverse hauling conditions, increasing their job production from 10 to 15 per cent in many cases.

Through the standardization of tire equipment for Tournapulls and Carryall scrapers, it is said that tire utility has been considerably increased. Also, interchangeability between front and back tires is now possible—worn traction tires being exchangeable with trailing tires. Less frequent replacement is said to be necessary with the larger tires. The use of the 21.00 by 24 tires on other units of the rubber-tired LeTourneau line, including the Tournatrailer, the Tournacrane, will result in similar advantages.



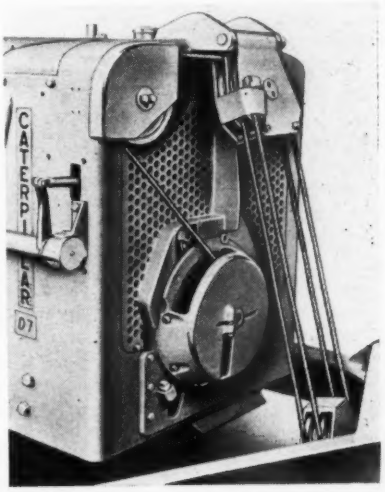
Left—a Tournapull-Drawn LP Carryall Equipped with 21.00 by 24 Tires. Right—the Same Unit Fitted with the 18.00 by 24 Tires

Cable Control Unit

THE Caterpillar Tractor Company, Peoria, Ill., has developed a new single-drum, front-mounted cable control, known as Model 24, for the operation of bulldozers used with Models D8, D7 and D6 Caterpillar tractors. The drum for all three tractor models is 9 in. in diameter and 2½ in. wide, and the flanges are 14 in. in diameter. The line speed varies with the tractors to which the drums are applied; the bare drum speed is 357 ft. per min. for the D8, 375 ft. per min. for the D7, and 525 ft. per min. for the D6. The full drum line speed is 527 ft. per min. for the D8, 552 ft. per min. for the D7 and 780 ft. per min. for the D6.

The clutch has a metallic facing and the brake band diameter and width in each model are 15 in. and 2½ in., respectively. The effective brake area is 111 sq. in. and the brake lining is molded. The approximate weight of the complete control assembly for each model is 550 lb.

Features claimed for the new No. 24 cable control include rapid positive action because it responds quickly to give accurate, powerful control with a minimum of operating effort, and because it permits rapid free spooling when desired. It is also claimed that the Caterpillar multiple-disc clutch with metallic facings provides easy clutch engagements for smooth operation. Synchronized brake release and clutch engagements are also said to add to smoother operation and to greatly reduce wear and heating.



The New Cable Control Unit

The control unit is said to be readily accessible, and all normal adjustments can be made from the outside of the unit. Removable covers permit ready access for inspection or the replacement of parts.

The front cable control is of compact design permitting close mounting to the tractor. The structural members and casing are of cast steel. Antifriction bearings are used throughout and the drum is set into a recess in the case to avoid cable fouling.

Earth Boring Drill

KA-MO Tools, Inc., Chicago, has developed a portable earth boring drill for various applications, such as boring holes for fence posts, telegraph poles, and anchors for guy lines, and for boring test holes and pilot holes for piling. Designed for either air or electric operation, this unit consists essentially of a motor geared directly to the drilling tool and provided with suitable handles to facilitate operation.

One of the Portable Drills in Operation

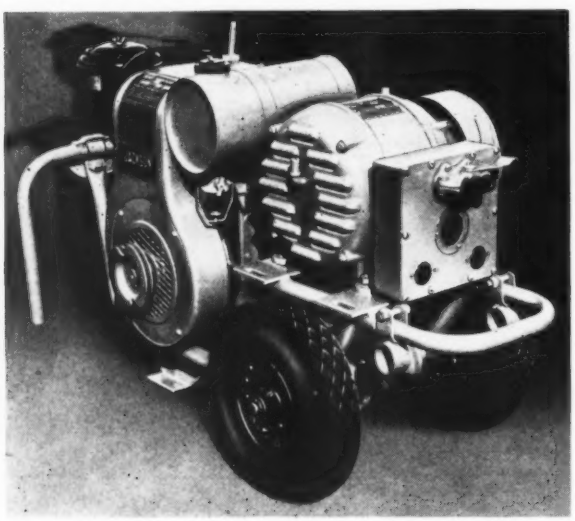
The drill is a single-plate helix placed about a central shaft in such a manner as to form a screw conveyor. It is provided with a removable double-edged cutting blade which can be reversed or renewed when dull or worn. The drills are made in sizes from 3 in. to 16 in. and in sections from 2 ft. to 4 ft. long, which can be coupled together by means of taper pins. The depth to which holes can be drilled depends upon the size of the drill and the character of the formation. With electric operation, the motor is geared down to provide a drill speed of 80 to 90 r.p.m.

Power for the motor is supplied by a portable 2½-kw. alternating-

current generator or a 3-kw. direct-current generator. A light drum hoist is also available for use with a gin pole or tripod for lifting the drill from the hole. The drum may be operated by hand or by the motor used for operating the drill. The drill may be operated at any angle, and is said to be well adapted to drilling holes under tracks or pavements for pipe lines. It is claimed that the drill can be easily handled by two men.

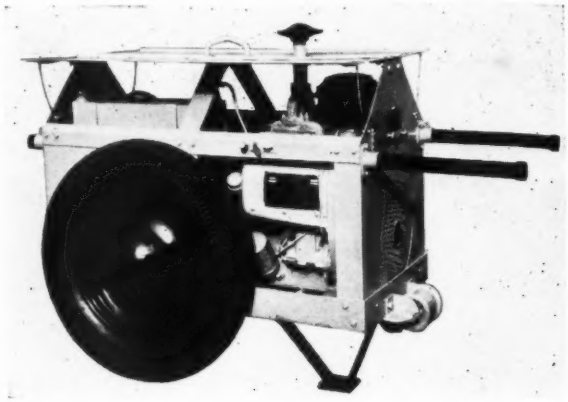
Portable Power Plants

THE Electric Tamper & Equipment Company, Ludington, Mich., has developed a new line of portable power plants, superseding the power plants formerly manufactured by this company. The new models, known as the M-1, M-2, and M-4, represent an entirely different type of construction from those built formerly. The parts comprising the generator in each of the new models have been reduced to 19 as compared to 140 in the old generator. As with the former line, the new units are designed as portable plants for furnishing electric power for emergency lighting and for the operation of tools used in railway track and bridge and building work.



The New Jackson M-2 Portable Power Plant

The M-1, the smallest and lightest of the three new models, weighs 243 lb., and will operate two Jackson tie tampers or light bridge and building tools to its full rated capacity. It has an output of 1.25 kva., single-phase, 115-volt, 60-cycle alternating current; 1.5 kva., three-phase, 115-volt, 60-cycle alternating current on continuous duty, or 1.75 kva., three-phase, 115-volt, 60-cycle alternating current on intermittent duty. It consists of a gasoline engine and generator compactly mounted on two pneumatic-tired wheels. The wheel-base is 21 in., and the unit is 25 in. high and 38 in. long over the handles.



The M-4 Power Plant Is the Largest of the Three New Models

The M-2 has a rated capacity of 2.5 kva., single or three-phase, 115-volt, 60-cycle alternating current. It operates four tie tampers, or bridge and building tools to full rated capacity. Two of the M-2 power plants are recommended by the manufacturer for the operation of eight tampers. This unit is also mounted on two pneumatic-tired wheels.

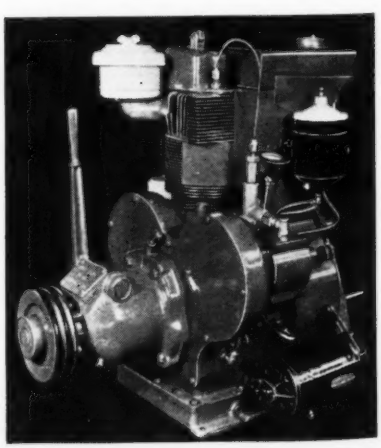
The M-4, the largest of the three models, has a rating of 5 kva. for continuous duty and 7.5 kva. for intermittent duty, and has the same current characteristics as the other two models. It is designed for the operation of 12 tie tampers or bridge and building tools to its full rated capacity. It is mounted on two standard automobile tires and is provided with four telescoping handles.

Permanent magnet generators are used in all three models. It is claimed that the maintenance of this type of generator is greatly reduced because of the elimination of brushes, the necessity for adjustment of brushes and brush holders, and the dressing of commutators and collector rings.

Air-Cooled Diesel

A NEW Diesel engine being built by the R. H. Sheppard Company, Hanover, Pa., said to be the smallest Diesel ever built for commercial use, and the only stationary Diesel of the air-cooled type, is now available as the power source for a range of railway equipment, including power communication systems, auxiliary lighting plants, pumps and generating plants for the operation of power tools.

Outstanding among the features of the new unit is its cooling system, which is said to be so efficient that, in spite of the high temperatures created by the high ratio of compression inherent in the engine, as in all Diesels, a hand can be laid on the cylinder without discomfort while



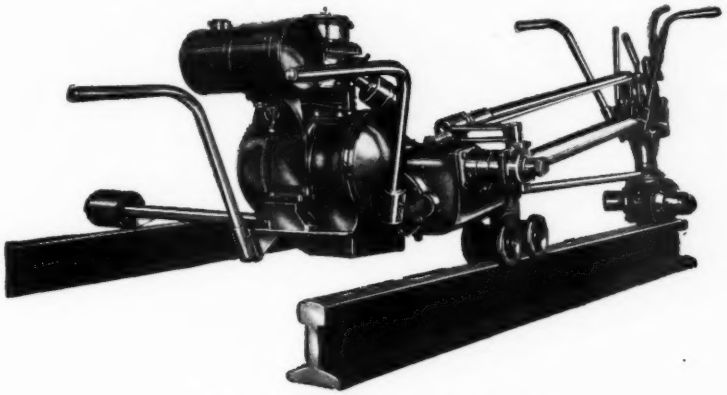
The New Unit Has 3¾ HP. Capacity

the engine is operating at full load. This cooling is accomplished by adequate cooling fins and by a fan-driven stream of fresh air which is made to pass constantly over the fins. The absence of a liquid cooling system not only reduces the weight of the unit, but it is claimed that it also reduces the time required for servicing and maintenance.

The new unit is a single-cylinder, four-cycle Diesel, with a 3-in. bore and a 4-in. stroke, developing 3¾ hp. at 1800 r.p.m., and it is equipped with both hand and 12-volt electric starting. The overall size of the engine is 28½ in. high, 20¾ in. wide, and 22½ in. long, with the crank removed.

A standard Sheppard fuel injection system is used on the unit, similar to that employed on other Sheppard Diesels, and an indication of the economy of operation of the new unit is seen in the capacity of its fuel tank, which holds only 9/10 gal.

The engine, including a power take-off and clutch, is complete as shipped, and is also available direct-connected to a 2-kw. generator with control box and rheostat.



The Raco Model B Power Track Wrench

Power Track Wrench

THE Railroad Accessories Corporation, New York, has introduced a new Raco power track wrench, known as Model B, which supplements this company's Model A power track machine. The Model B has greater power and is claimed to have greater flexibility and ease of operation. It is powered by a Briggs & Stratton 7.20-hp. gasoline engine, operating at a normal speed of 2700 r.p.m. The chucks operate in unison from one set of controls, each having high and low speeds, both forward and reverse. At normal engine speeds the chucks revolve at 120 r.p.m. in high speed, and at 20 r.p.m. in low speed. The chuck head does not turn, and is designed so that the chucks engage the nuts squarely on either side of rail. The control lever is said to allow instant shift through neutral to either high or low speed. The full power lever is at the operator's left hand and operates through the Micro cutout, or load release, without regard to the setting of the cutout, and the reverse lever is on the side of the operating head. All handles and levers are raised to provide for operation without stooping.

The Micro cutout is located in a cylinder on the side of the gear housing. It is readily accessible by removing a cap at the end of the cylinder, which can be locked with a car seal to prevent tampering. The automatic torque control for accurate out-of-face tightening is combined with excess power when needed for rapid removal of rusted nuts in rail-laying operations. The high speed runs new nuts on to within a fraction of a turn, after which a direct quick switch into low puts them up to the Micro cutout torque setting. It is claimed that, if the ties are not high or the spikes do not interfere with the work, the new wrench will practically eliminate the need for a burning outfit in rail laying.

The weight of the complete unit is 470 lb. Handles for lifting by three men are so located as to permit of balanced weight distribution. The outboard roller arm is removable for convenience in storing and shipping. All moving parts except the chucks are housed, and a reinforced chassis is said to provide for self-alinement of the engine. The Model A Raco power track machine is still available for use where excessive power and speed are not required.

New Wagon Drill

THE Worthington Pump and Machinery Corporation, Harrison, N.J., is putting into production a newly-designed Blue Brute wagon drill, the UMW-40, which incorporates several radical design features said to produce strong rotation, low air consumption and exceptional drilling speed to give low cost per foot of drilling. Heat-treated alloy steel is used in all major parts, and slow rotation parts are available.

The UMW-40 uses a heavy-duty 4-in. drifter, which may be easily converted to wet drilling. It has rifle-bar rotation, a positive-acting end-seating valve with a circumferential seal, and a cylinder-controlled blowing device, which is said to provide exceptional hole cleaning ability. Added features include a one-piece chuck sleeve, a positive locking chuck for 1¼-in. hollow round lug shank drill steels, and one air hose to the backhead with a swivel to prevent fouling.

The feed mechanism controls are within easy reach of the operator and the feed is transmitted by a roller chain guided over large gear and idler sprockets, for which an improved chain takeup has been provided. Power is supplied by a six-vane rotary air motor, through enclosed, large-size gears on tapered roller bearings. A rigid, heavy-duty centralizer with replaceable bushings may be adapted to line drilling. The sliding trunnion is adjustable on the

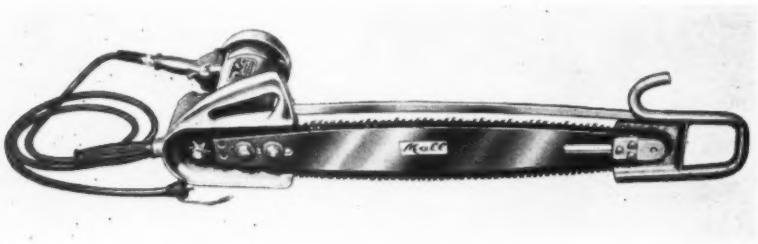
The New Blue Brute Wagon Drill Has Several Special Design Features

side, instead of underneath the guide channel, and is readily adjustable in all drilling positions, while an adjustable anchor prong on the side of the guide channel holds the feed assembly in perfect alinement.

A one-man lifting device on the wagon mounting permits quick adjustment of the U-arm and drilling unit. Furthermore, the U-arm may be moved on the tubular frame for unusual drilling conditions, and quick-locking rear wheels may be turned through 90 deg. for drilling vertical holes close to a quarry face.

Electric Chain Saw

THE Mall Tool Company, Chicago, has developed a new electric chain saw in two models, 418 and 424, which have cutting capacities of 18 in. and 24 in., respectively. Powered by a 1½-hp. Universal type electric motor, each of the new models operates on 110 or 220-volt 25, 50 or 60-cycle single-phase alternating current or on direct current.



One of the New Mall Electric Chain Saws

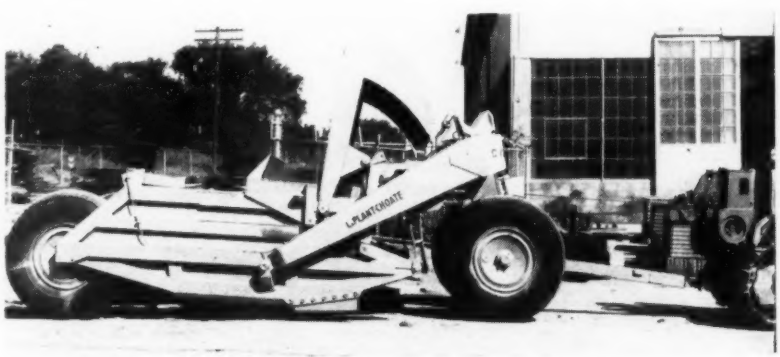
Features claimed for the new saw include a heat-treated and matched spur gear drive, a special heat-treated saw-steel chain, a chain-tension adjustment on the motor end of the saw, a guide plate that is reversible end for end, and a guard bar for protecting the operator and for protecting the saw teeth when using a wedge. It is said that the saw can be used horizontally, vertically, or at any angle. It is especially designed for cutting and squaring large timbers and topping piles. The smaller of the two models weighs 52 lb. and the larger 54 lb.

Carrimor Scrapers

IMPORTANT improvements in scraper design and operation are said to be incorporated in new 8½-cu. yd. and 13½-cu. yd. cable-operated Carrimor scrapers that have been placed in production by The LaPlant-Choate Manufacturing Company, Cedar Rapids, Iowa. The new scrapers are relatively low and wide, a characteristic that is said to permit obtaining heaped loads quicker with less power. They have wide open-top bowls with no overhead obstructions. The scrapers are of the front-dump type, with the dumping and spreading operations being accomplished by means of positive forced ejection. The rear gate moves forward, bulldozing the material from the bowl while an apron at the front moves upward and outward simultaneously by means of a link arrangement. It is claimed that this eliminates any compaction of the load between the gate and apron, enabling the load to be ejected cleanly and completely without sticky or bulky material becoming jammed in the bowl.

Among the features claimed for the scrapers is the floating front apron which is said to provide an ample initial opening for loading without any movement of the tail gate, a feature that is said to permit the loading of any material, including rocks and stumps. Another feature is a three-piece bowed reversible cutting edge with the center section offset, which is said to enable the entire weight of the scraper to be concentrated on the few center inches of the digging element, providing, it is claimed, instant penetration in any kind of material. This type of cutting edge, together with the bowl design, is said to direct the flow of material into the center of the bowl where it "fountains" up until a full heaped load is obtained. In addition, eccentric hoist sheaves are provided that automatically create a pumping action designed to increase the ease and speed of loading.

The cable arrangement has been redesigned to permit of carrying uniform spreads when unloading at high speeds. To accomplish this, the cutting edge is said to be positively controlled and to be independent of other moving elements, permitting it to be set and locked at any desired spreading depth to provide a smooth even spread without further manipulation of the power-control unit.



One of the New Carrimor Scrapers

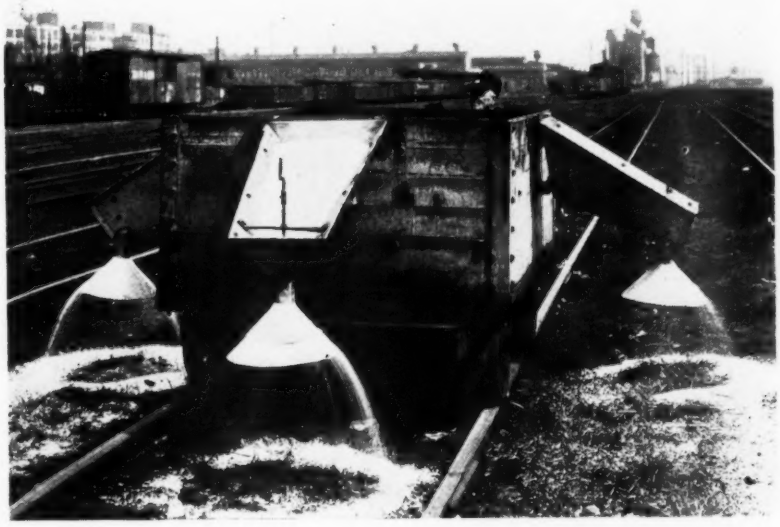
Salt Spreader for Weed Killing

AFTER several months of experiments, the Wabash, in co-operation with the International Salt Company, Inc., has developed an improved spreading unit for use in distributing salt along the right-of-way for weed killing purposes. The spreader is portable and is designed to be placed on a standard trailer car which is handled by a motor car.

In the early experiments the rock salt was spread by hand, using shovels. Handcars were then equipped with three small salt boxes provided with distributing cones for automatically spreading the salt. Two of these boxes overhung the sides of the car for spreading the salt outside the rails and the third was placed on one end of the car to permit the salt to be distributed between the rails. The salt was fed from a small opening in the bottom of each box to the apex of a distributing cone which scattered it evenly over the ground.

The Wabash spreader includes several improvements over the early designs. It has a removable bottomless box forming a frame for the support of the salt bins and spreaders, which

can be placed on any standard push car, eliminating the necessity for equipping a special car that can be used only for weed killing. The salt bins and spreaders are hinged to the top of the box to permit of their being raised to clear switch stands or other obstructions. The salt is discharged from each bin through a 3-in. pipe which covers the apex of the distributing cone, the discharge being regulated by raising or lowering the cone which increases or decreases the opening between the pipe and the cone. This is said to provide better distribution than by the use of a slide gate.



The Salt Spreader in Operation

Concrete Mixers

THE Chain Belt Company, Milwaukee, Wis., has added four new and redesigned Rex concrete mixers to its line of concrete handling and mixing machinery, all conforming to the new Associated General Contractor's standards. The four new models are the 6S, 11S, 16S, and the 3½S. The 6S is a new mixer and supplants the former 5S and the 7S designs. It was the first of the new units to be placed in production. Features claimed for the Rex 6S include a completely redesigned chassis, low overall height, wide wheel tread and low center of gravity for ease in parking, towing and spotting. For convenience the controls have been grouped on one side of the machine. It also incorporates a new water system and a new drum design, which are said to result in easier operation and better mixing qualities.

The 11S is available in either a two-wheel or four-wheel mounting with end discharge. The 16S is mounted on a four-wheel chassis with either side or end discharge. Improvements claimed for these models include the relocation of lubrication fittings so that they are all readily available for convenient greasing, a redesigned water system, a new slip-stream shimmy skip and the choice of air or water-cooled motors.

The Rex 3½S mixer, with end discharge tilter, is the latest addition and will complete the line of Rex mixers. Having a two-wheel mounting, this unit has a pressed steel drum bowl with a 19-in. drum opening, a 2½-hp., air-cooled gasoline engine, with roller chain drive, a 24-in. tilting handwheel with ratchet lock, rigid box-section cradle, cantilever springs and a removable tow pole.

The New Rex 6S Concrete Mixer

Portable Pumps

THE Homelite Corporation, Port Chester, N.Y., has introduced three new models of portable, self-priming centrifugal pumps with sizes of 3 in., 2 in. and 1½ in. As with former models, the new pumps are completely portable and are powered by built-in Homelite gasoline engines. The new 3-in. pump, designated as Model 2453, weighs 95 lb. complete and has a pumping capacity up to 15,000 gal. per hr. The 2-in. pump weighs 88 lb. complete and has a pumping capacity up to 10,000 gal. per hr. This is known as Model 1952. The 1½-in. pump, known as Model 2251½, weighs 48 lb. and has a pumping capacity up to 4,000 gal. per hr.

The total pumping head, including friction, is 75 ft. for the 1½-in. pump and 80 ft. for the 2-in. and 3-in. pumps. Features claimed for the new pumps include automatic priming, and the ability to handle up to 35 per cent solids. Also, they are guaranteed to prime themselves and to pump at suction lifts up to 28 ft. The pumps are self-cleaning, and are said to embody a design that permits mud and other solids to be passed freely and that prevents settlement in the pump body.

All the pumps are powered with single-cylinder, air-cooled, two-cycle gasoline engines, direct connected to the pumps. The crankshafts are one-piece drop-forgings. Ball bearings are used on the crankshafts, connect-

ing rods and magneto-shaft bearings. All engines are equipped with automatic built-in mechanical-type governors, are fully enclosed and self lubricating. Ignition is by means of high-tension flywheel type Wico magnetos on Models 2453 and 1952, and by an enclosed Scintilla magneto on Model 2251½. The crankcases are of special alloy, and heat-treated wear-resistant alloys are used for the cylinders and pistons. The pump casings are constructed of abrasive-resisting aluminum alloys. Since the impeller is mounted directly on the crankshaft of the engine, no pump bearings are required.

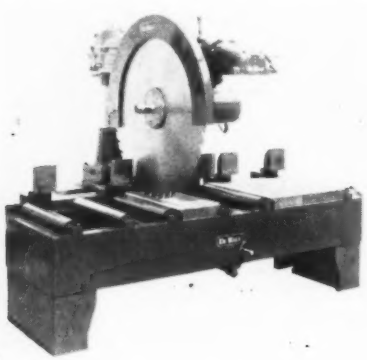
One of the New Homelite Pumps in Operation

Power Saw and Dapping Machine

THE DeWalt Products Corporation, Lancaster, Pa., has developed a motor-driven cutting machine designed to cross-cut heavy timbers up to 16 in. by 26 in., and to make miter cuts at any angle. The machine is made in two models, namely, Model TC-12, which has a 36-in. saw with a cross-cut capacity of 12 in. by 18 in. and the ability to make miter cuts of 45 deg. in 12-in. by 12-in. timbers, and Model TC-16, which has a 44-in. saw with a cross-cut capacity of 16 in. by 26 in. and can make miter cuts in 16-in. by 16-in. material. Miter cuts can be made at any angle.

When equipped with standard dado heads, the machines will handle various dapping operations. Both models are self-contained units with roller conveyor tables, on which the saw carriages are mounted, traveling on machined-enclosed rollways. The ball bearings are of the shielded type with track wipers to keep the rollways clean. Both saws are powered with DeWalt 10-hp. 3-phase alternating-current electric motors. The motors are of the enclosed fan-cooled direct-drive type, are insulated with Formex Fiberglas, and are provided with life-sealed ball bearings.

The operating levers in each model are located at the front of the machine, including the arm-lock handle which releases or clamps the arm at the desired position. A front elevating mechanism raises or lowers the column in setting the depth of cut desired. A dual-chain feed concealed within the machine arm is said to enable the operator to control the cutting action at all times. The roller conveyor table facilitates handling the material, which is said to lie flat at all times, moving in one direction. Adjustable, segmental back guides are provided which can be set for any position of the saw.

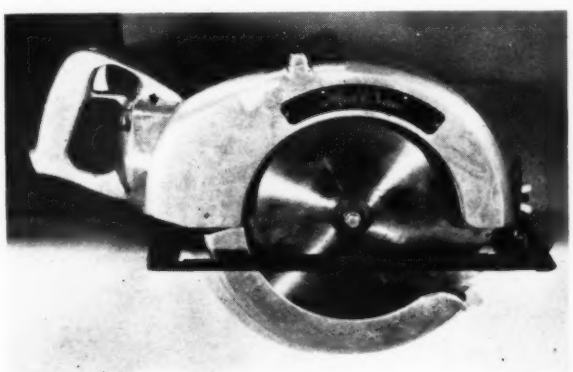


The DeWalt Motor-Driven Timber Cutting Machine

Electric Hand Saw

THE Mall Tool Company, Chicago, has developed a new electric circular hand saw, known as Model 128, which has a 12-in. blade. Features claimed for the saw include extra large gears and pinions encased in grease chambers of ample size to provide continuous lubrication and smooth operation; the Mall automatic safety guard which opens as the saw is pushed into the material being sawed; a swivel base which is adjustable for angle cuts up to 45 deg.; a ruggedly constructed lightweight housing; and an upper guard for protection against flying chips.

The saw is powered with a Universal electric motor and will operate on 110 or 220-volt alternating or direct current. It has a cutting capacity of 4½ in. on straight cuts and 3 in. on cuts at an angle of 45 deg. A shatter-proof glass shield provides the operator with a clear view of the cutting line. Standard equipment includes an all-steel carrying case, 10 ft. of conductor cord, one 12-in. cut-off saw blade and one 12-in. combination rip and cross-cut blade, and a rip fence guide. The weight of the saw is 36 lb.



The Mall Model 128 Electric Hand Saw

Road-Rail Crane Car

THE Silent Hoist & Crane Co., Brooklyn, N.Y., has introduced a machine known as the Rail-O-Road Krane Kar, which consists of this company's Krane Kar equipped with retractable flanged wheels in addition

to the standard rubber-tired wheels. Hence the unit can be operated as a rubber-tired crane on the road or as a rail-mounted crane on the tracks. It is regularly equipped with a reverse gear transmission, providing four speeds forward or in reverse. It is built in three models with lifting capacities of 5,000 lb., 10,000 lb. and 20,000 lb. The three models are available with the following extra equipment: Totally enclosed all-weather cab with shatterproof glass; an auxiliary gypsy winch with disconnect clutch; a towing pintle hook; 25-in. or 29-in. electro magnets with auxiliary gasoline-engine powered electric generators; magnetic controller panel; master operating switch; and a ⅜-cu. yd. general-purpose clamshell bucket. The crane can be furnished with either solid or pneumatic tires.

The Rail-O-Road Krane Kar Handling Crossties

Power Track Drill

A NEW power track drill has been developed by the Buda Company, Harvey, Ill., which, weighing only 130 lb., is light enough to be carried easily by two men. It is mounted on a light steel frame and is equipped with carrying handles which form a part of the frame. A spindle chuck is available to permit the drilling of holes from ¾ in. to 1½ in. in diameter. The speed ratio is 30 to 1, with a gear ratio designed to insure ease of operation within the power of the motor. It is claimed that it will drill through "T" rails, "I" beams and girder rails of any weight.

The drill, which is powered by a 1½-hp. air-cooled gasoline engine, is provided with the necessary adjustments to permit raising or lowering of the drill bit as desired, and a crank controls the speed and direction of drilling. The machine is held in place on the rail by an over-clutch hook with a foot and hand release, an arrangement which it is claimed will permit its removal from the track in ten seconds. The drill can be used either inside or outside the rail, is compact in design and can be used in close quarters when necessary to drill rails located near switches. It is said that only one man is required to operate the drill, to move it along the track, or to remove it from the rail.

The New Buda Power Track Drill

Mobile Air Compressor

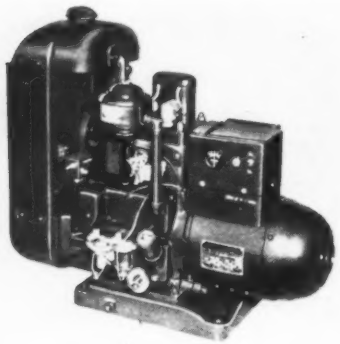
THE Le Roi Company, Milwaukee, Wis., has introduced a new portable air compressor, known as the Tractair, which consists of a 105 c.f.m. air compressor combined integrally with a 35-hp. Le Roi Centaur tractor mounted on four pneumatic tires and having a five-speed transmission. The latest developments in industrial engine design are incorporated in the six-cylinder air-power unit which is entirely new. The cylinder block is in one casting with hardened wet cylinder sleeves and precision, shell-type bearings. In addition to serving as a carrier for the air compressor, the tractor can be utilized for tractive purposes, as the engine is said to be powerful enough to permit the unit to be used as a tractor while maintaining a full head of compressed air.

The Le Roy Tractair Portable Air Compressor

Combination Generator

FAIRBANKS, Morse & Co., Chicago, is producing a new combination-voltage electric light and power plant, which produces both alternating and direct current simultaneously. The unit consists of a 3,000-watt generator direct-connected to a 6½-hp. single-cylinder water-cooled gasoline engine operating at 1800 r.p.m. The entire output of the plant may be used as 115-volt, 60-cycle alternating current with low charging rate to 32-volt batteries, or it may be used to produce any quantity of 32-volt direct current up to 750 watts.

plus the remainder in alternating current. The plant is adapted to use for lighting, for operating small power tools and for communication systems. It is said that 32-volt batteries can be charged at the same time the unit is furnishing alternating current for tools, motors and other equipment.



The Fairbanks, Morse Combination-Voltage Generator

One-Man Snow Plow

THE Gravely Motor Plow & Cultivator Co., Dunbar, W. Va., has developed a one-man tractor-driven snow plow that can be converted to a sickle mower, rotary mower or a power-driven rotary brush. For use as a snow plow the unit is available in two different models—the reversible-blade type, with a dozer-like blade, or the V-type.

Mounted on two pneumatic-tired wheels and equipped with two hand grips for the operator, the plow is powered by a 5-hp. four-cycle, air-cooled gasoline engine, equipped with an Edison-Splitdorf magneto, Donaldson oil-bath air cleaner and Zenith carburetor. It has two speeds forward and one in reverse; the low speed ranging from ¼ to 3 m.p.h. and the high speed from 1 to 6 m.p.h. Blade and traction controls are conveniently located on the steering handles. The plow will handle snow as deep as 12 to 14 in. All the attachments for the unit are readily interchangeable as the same four bolts are used in all cases to attach them to the tractor.

The Gravely Snow Plow in Action

Concrete Vibrator

THE Electric Tamper & Equipment Co., Ludington, Mich., has developed an improved electric motor-driven flexible-shaft concrete vibrator, known as Model FS-7A, which replaces Models FS-4A and FS-5A. The new model is similar to the former vibrators except that, although it is much smaller and lighter, it is more powerful. Driven by a motor weighing 28 lb., the new vibrator will deliver from 7,000 to 10,000 vibrations per minute, depending upon the length of the shaft used and the consistency of the concrete, while the maximum frequency of the older models was 7,200 vibrations per minute. It can be equipped with flexible shafting in 24-in., 36-in., 7-ft., 14-ft. or 21-ft. lengths, and will handle all vibrator heads which were formerly used with the two previous models. Vibrator heads can be furnished with diameters of 1¾ in. and 2 in. in 10-in. lengths, and with diameters of 2 in. and 2⅜ in. in 18½-in. lengths. Grinding and drilling accessories are available for use with the vibrator. The electric motor that powers the unit operates on 115-volt, 60-cycle, single-phase alternating or direct current.

The Model FS-7A Concrete Vibrator

Unit Mobile Crane

DESIGNATED as Model 357, a new self-propelled mobile crane has been introduced by the Unit Crane & Shovel Corp., Milwaukee, Wis. Mounted on four pneumatic-tired wheels, the new crane is designed for operation over both paved highways and rough terrain. It is convertible for use as a shovel, trench hoe, backfiller, clamshell, dragline or pile driver, or for use with a magnet. In addition to its application in maintenance work, the Model 357 is recommended for use in railroad shops and by stores departments. When used as a crane it has a capacity of 3 to 7 tons, and when operated as a dragline, clamshell or shovel its capacity ranges from ⅜ to ½ yd.

The Model 357 is powered by a 6-cylinder heavy-duty industrial gasoline engine, rated at 60 hp. The engine is operated at 1550 r.p.m. for normal operation and at 2550 r.p.m. when traveling, which permits a maximum travel speed of 9 m.p.h. Diesel engine drive can be furnished if desired. The engine is equipped with an electric starter, oil wash cleaner, battery ignition and 40-gal. fuel tank. The unit has four-wheel

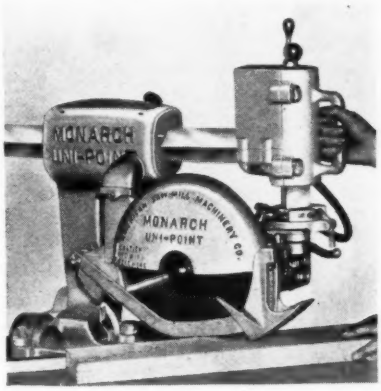
air brakes and a two-speed air-actuated transmission.

In common with other Unit machines, the Model 357 is equipped with the newly-developed Full-Vision cab. This cab is of the automobile type and is said to provide clear visibility for the operator around a complete circle, not only supplying better light and vision, but also providing full protection against inclement weather.

The Model 357 Self-Propelled Mobile Crane, Operating as a Dragline

Portable Radial Saw

THE American Saw Mill Machinery Company, Hackettstown, N.J., has announced the addition of a new light-weight portable 12-in. electric radial saw to its line of Monarch Uni-Point woodworking machinery.



The Portable Monarch Uni-Point 12-In. Radial Saw

Powered by a 1½-hp. electric motor, the new saw weighs approximately 200 lb., complete with carrying frame, and is designed to be carried by two men. It is a compact unit and will pass through a 30-in. doorway. It has a 3-in. by 16-in. crosscut capacity and a 20-in. wide ripping capacity, and it is claimed that it will handle the different kinds of work that heavy stationary saws will do.

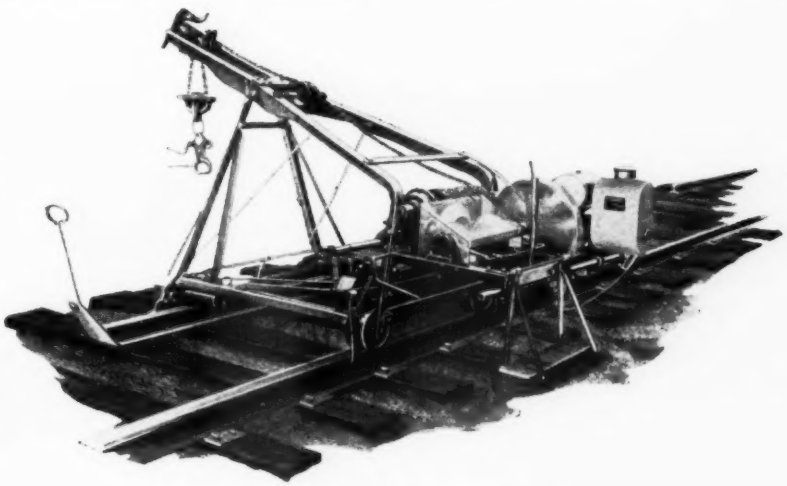
The new saw is said to embody all of the principal features of the large size stationary Monarch Uni-Point radial saws. Chief among these features is the Uni-Point cutting principle. Other speed and safety features claimed for the saw, include a specially-designed saw guard with a telescoping undercarriage that keeps the saw teeth covered at all times. When the saw enters the wood for a rip cut, a cam action anti-kickback arrangement serves as a protection to the operator while the cut is in progress by preventing backward thrust. The Monarch portable radial saw is said to be made almost entirely of magnesium, a feature which accounts for its comparatively light weight.

Meco Rail Layers

THE Maintenance Equipment Company, Chicago, has made a number of improvements in both the Meco Power Rail Layer and the hand-operated machine. These machines have been equipped with self-locking rail grips, making it possible to lift the rail without the necessity of the operator holding the gripping lever in place. The hoisting trolley stops have been made adjustable so that the rail can be lowered to gage, and the double-flanged wheels running on the rail opposite the rail to be relaid, and the rollers which travel on the auxiliary rail, are now equipped with roller bearings to permit greater ease of operation.

Also, the auxiliary rail is provided with a wider base to eliminate any possibility of its tipping when the machine is moved over it when placing a new rail.

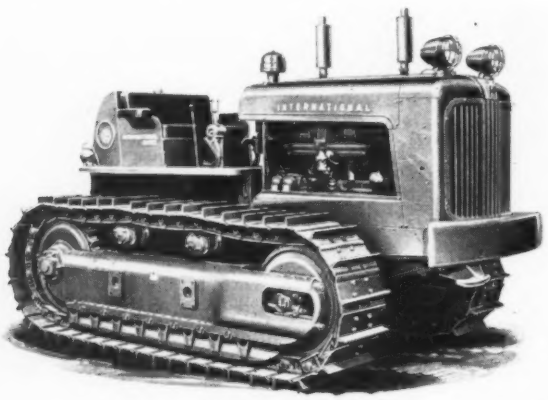
The Meco set-off and transfer has been provided as auxiliary equipment to facilitate the removal of the Power Rail Layer from the track to clear traffic or to transfer the machine to the opposite rail or across the intertrack space, provided the track centers do not exceed 14 ft. With this set-off, four men can handle the machine, while formerly a gang of men was required to lift it by means of the lifting handles. The complete set-off and transfer weighs only 137 lb. and is carried in hangers under the engine platform, in the clear of the work, when not in use.



The Improved Meco Power Rail Layer

Large Crawler Tractor

A NEW model Diesel crawler tractor, having a maximum drawbar horse power of 130 and a maximum belt horsepower of 150, has been announced by the International Harvester Company, Chicago. Designated the TD-24, the new model weighs approximately 35,000 lb. and is the largest tractor ever built by this company. Features claimed for the new tractor include a new type of steering for easy and positive control, the use of special-sealing anti-friction bearings in the track rollers, and convenient mounting for all types of allied equipment. It has eight speeds, ranging from 1.6 m.p.h. to 7.8 m.p.h. and connecting rod bearings. The TD-24 will be produced at the company's new Melrose Park (Chicago) works, now under construction and will not be available for sale for some time.



The New International TD-24 Diesel Tractor

The new model is powered by a new International six-cylinder, full-Diesel engine with a built-in gasoline starting system, together with an electric starter. The engine has replaceable hardened cylinder sleeves, full-pressure lubrication, Tocco hardened crankshaft, and large diameter main

Athey Mobiloader

ANNOUNCEMENT has been made by The Athey Products Corporation, Chicago, of the development of a new Mobiloader, known as Model W4-5, which replaces Model W4-1. Like its predecessor, the Model W4-5 Mobiloader is essentially an overhead loading attachment for mounting on a crawler tractor, being designed for use with Caterpillar wide-gage Model D4 tractors. The new Mobiloader is said to incorporate a new and exclusive application of hydraulics with a single finger-tip control that results in the instant response of the full power of the tractor.

The Model W4-5 Mobiloader

Improvements made in the design of the Mobiloader are said to result in greater visibility, while its streamline mounting is claimed to permit full accessability to the tractor engine. Another improvement is a saving in weight which has been achieved while strengthening parts subjected to the greatest stress. Emphasis has been placed on achieving a balanced mounting on the tractor for greater traction and minimum wear on idlers and rollers. Interchangeable bucket equipment is available in sizes for various types and weights of material. Also an interchangeable bulldozer blade can be installed on the lift arms, thereby further increasing the unit's field of usefulness.

New Paint Spray Gun

A NEW light-weight spray gun, Model 19, has been developed by the Binks Manufacturing Company, Chicago, which is said to incorporate a number of improvements over the pre-war models of this company. The gun weighs 1 lb. 7 oz., is said to be easy to operate, and has a grip which is designed to fit the hand. These features, it is claimed, reduce fatigue to a minimum. Special features of the gun include a self-centering type nozzle, designed on the tapered-seat principle, a cartridge-type air valve, a needle valve which is said to be easily adjusted, standard hose connections, and a retainer ring which it is claimed will prevent air from leaking back through the gun.

The Model 19 Spray Gun

A large air passage through the gun is said to result in better utilization of the air. All controls are located at the back.

The gun has few parts, which is said to make it easy to take apart for cleaning or repairing. Each part is made of a material highly suitable for its particular function. The body is of aluminum; the air nozzle is of bronze; the fluid nozzle is of a special

hardened steel; and the entire gun is nickel-plated. A hardened plate prevents wear at the point where the trigger contacts the air valve stem.

Esco Track Walking Shoes and Wingdozer

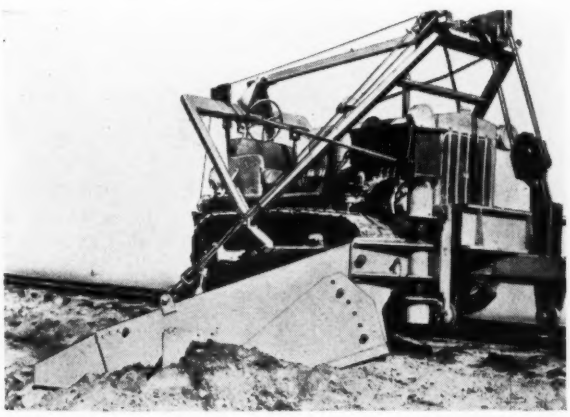
THE Electric Steel Foundry, Portland, Ore., has developed two products, known as Esco Track Walking Shoes and Esco Wingdozers, which are said to convert a crawler-type tractor into an on-track machine for use as a grader, a ballast-shoulder skeletonizer, or a ballast spreader and shaper.

The track walking shoes, which permit tractors to operate on the rails, are made of cast steel, and each incorporates a lug, or flange, integral with the shoe, which acts as a guide for holding the tractor on and for steering it along the rails. The shoes can be installed on any crawler-type tractor having a tread track spacing of 50 to 66 in. center to center.

It is claimed that tractors equipped with track walking shoes can operate satisfactorily both on and off the rails, and can travel from 5 to 8 m.p.h. when mounted on the track. Furthermore, it is said that the large area of contact between the tractor shoes and the rails prevents injury to the rails and produces maximum traction for the tractor, enabling it to utilize its full pulling power for on-track operations. One of the chief advantages of a tractor equipped with track walking shoes is that it can be made to leave the rails quickly, thus permitting maximum on-track operation with minimum loss of time due to trains.

A Tractor Equipped With Esco Track Walking Shoes

The Wingdozer is a unit consisting of a steel framework supporting a specially designed steel blade, with adjustable auxiliary blade attachments, which, when mounted on a tractor equipped with track walking shoes, can be used for grading, cutting out old ballast from the track shoulder, and ballast spreading. The blade can be raised or lowered or moved horizontally to permit proper adjustment for various operations, these adjustments being made by means of hand wheels to the right and left of the operator's seat.

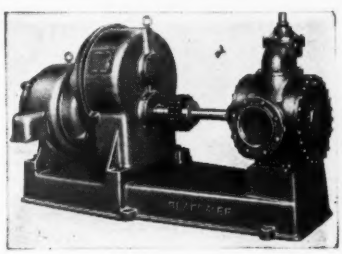


A Wingdozer In Operation

Equipped with other attachments, such as a winch or double drum, a crane boom or pile-driving leads, the track walking shoe-equipped tractor can carry out a number of other routine track and bridge maintenance operations, either on track or off track.

Rotary Sludge Pump

The Blackmer Pump Company, Grand Rapids, Mich., has announced the introduction of an improved steam-jacketed rotary pumping unit which is designed specially for handling sludge and other viscous liquids. It has a capacity of 500 gal. per min. at 150 lb. per sq. in. pressure, and is powered by a 75 hp. gear-head motor with a speed of 150 r.p.m. of the drive shaft. The pump is constructed of iron with bronze fittings, and the entire unit is mounted on a castiron base. The steam jackets are said to be suitable for pressures up to 125 lb. per sq. in., and are located on both heads. Units in capacities of 50, 90 and 200 gal. per min., with gear-head or reduction gear drives, are also available with steam-jacketed heads of this same construction. All of the new units are said to operate on the "bucket design," swinging-vane principle, and are claimed to be self-adjusting for wear.



Improved Blackmer Sludge Pump

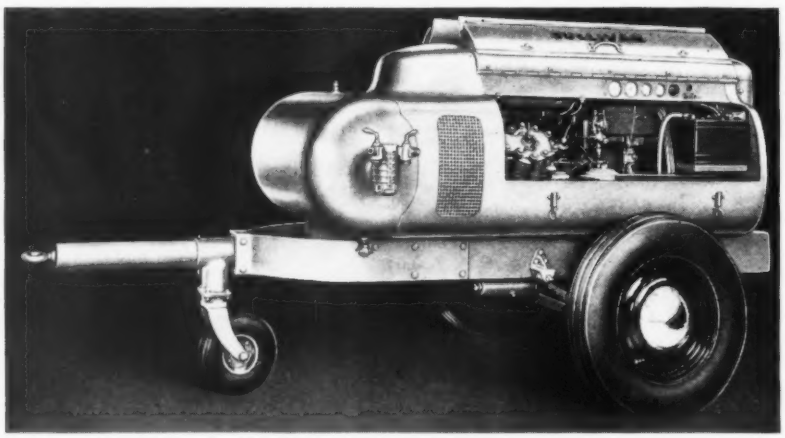
Sullivan Compressors

THE Sullivan Machinery Company, Michigan City, Ind., has introduced a new line of portable air compressors, known as Series 80. The compressors are made in three sizes with capacities of 105, 210 and 315 cu. ft. of free air per minute at 100 lb. pressure. They are powered with either gasoline or Diesel engines of the proper rating, as desired.

All models are mounted on two pneumatic-tired wheels, with the exception of the 315-cu. ft. unit with Diesel drive, which has a four-wheel mounting. The two-wheel units are provided with a third wheel which acts as a support when the machine is in operation and to permit its be-

ing more readily moved by man-power when on the job. The units have streamlined bodies with side covers having piano-type hinges to facilitate opening and closing.

Features claimed for these compressors include matched power plants with engines operating at efficient speeds; low lift, large port-area, direct-concentric valves; two-stage compression; streamlined air passages with Econo-Miser load control regulating air supply to the demand by controlling speed of engine; force-feed lubrication to all moving parts; Cascade oil cooling; and low piston speeds.



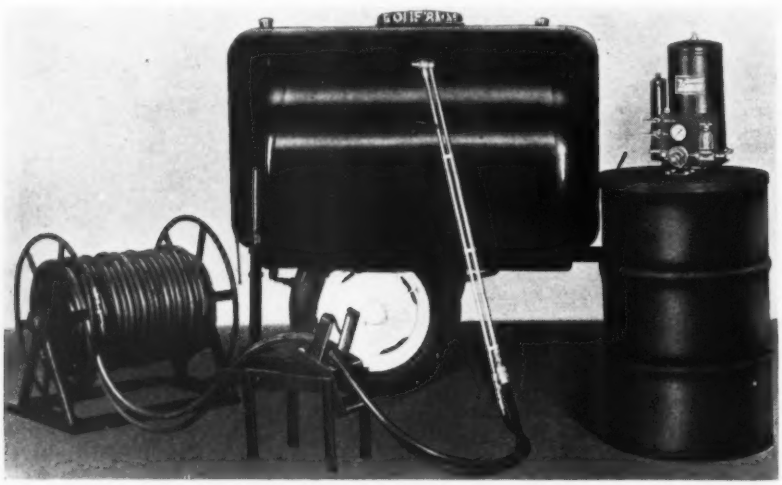
The Model 105 Series 80 Sullivan Compressor

Alemite Pump

THE Stewart-Warner Corporation, Chicago, has developed a new pump that is designed to pump heavy liquids, paints and other materials used in the protective coating of bridges, buildings, tanks and other structures by the spraying method. Known as the Alemite Versatal pump, the new unit is a double-acting reciprocating pump, operated by a 3-in. air motor, and requires air at pressures from 40 to 60 lb., depending upon the material handled and the distance or height it is to be pumped. It is said that it will pump heavy mill paint to a height equivalent to 10 stories, or 1,000 ft. horizontally. The pump and air motor are enclosed in a metal casing, and when in use they are mounted on the drum, barrel or other material container. The pump is provided with an air chamber of special design to prevent pulsations in the delivery line.

Material pumped from the container is delivered through a hose line to a nozzle, from which, with the aid of compressed air from a separate hose, it is emitted in the form of a spray. Air for the spray nozzle and for operating the pump may be supplied from existing air lines, or from a portable air compressor as shown in the accompanying illustration. The compressor shown is powered by a gasoline engine and has a capacity of 60 cu. ft. of air per minute at 100 lb. pressure.

It is claimed that the Versatal pump will pump almost any material that is fluid enough to seek its own level and is especially adapted to handling heavy asphalt or other emulsions containing fibrous material.



The Alemite Versatal Pump (on Drum) with Compressor, Hose Reel and Spray Nozzle

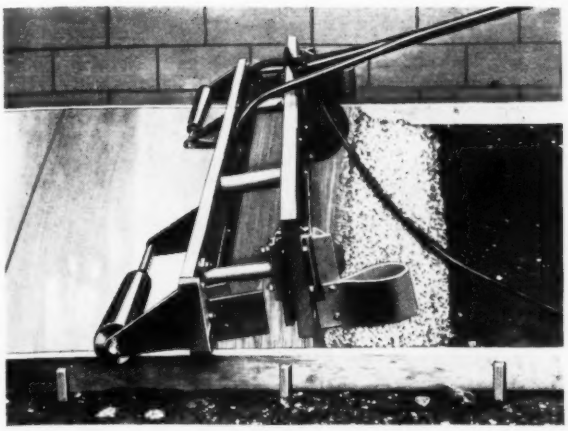
Fluorescent Lamps

A NEW fluorescent lamp, which is said to furnish a warmer-appearing daylight color, known as 4500 degree white, has been developed by the Westinghouse Lamp Division, Bloomfield, N.J. The new light color was made possible by the development of a formula for making and mixing the phosphor crystals which produce the regular daylight and white lights. The new color is said to be about midway in color quality and light output between the present standard white fluorescent lamp and the daylight lamp. It derives its color designation, 4500 degree white, from its color-temperature measurement on the Kelvin scale.

The new light is being offered in only the 40 and 100-watt sizes at the present time, but the standard white and daylight lamps are still available in various sizes.

Vibratory Screed

A NEW vibratory finishing screed, known as Model SC-11A, has been developed by the Electric Tamper & Equipment Co., Ludington, Mich. The new model is a one-man screed and replaces this company's Model SC-4A screed which required two men for handling. With the new model, one man merely guides the machine as it propels itself in the required direction. It is powered by a three-phase electric motor which can be operated from commercial power lines, although the manufacturer advises that it is preferable to use power from its M-1 portable power unit which is said to permit a wide range of frequencies for the placing and finishing of either highly workable or very dry harsh concrete. With rollers and retaining wings allowing a 36-in. adjustment, basic widths of 8 ft. and 12 ft. can be reduced to handle 5-ft. and 9-ft. jobs without changing planks. The new screed is said to be for general-purpose use for a wide range of concrete surfacing operations, including concrete floors, ramps,



Showing the Model SC-11A Vibratory Finishing Screed in Operation

decks, platforms, sidewalks and similar construction. It can be readily placed and removed by one man.

New 1½-Yd Excavator

THE Bucyrus-Erie Company, South Milwaukee, Wis., has introduced a new 1½-yd. fully-convertible excavator, known as Model 38-B. The new machine is designed for equal effectiveness as a shovel, dragline or crane. Advantages claimed for the new unit as a shovel include a strong but light boom with point sheaves of large diameter for effective application of digging force, independent positive twin rope crowd, and a high-lip all-welded dipper for fast filling and dumping in rock or dirt.

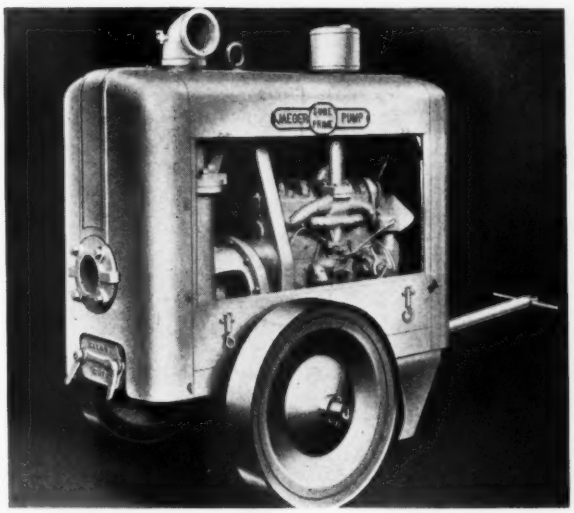
As a dragline, the 38-B is said to have a large working range, with a new mast-type suspension available for long booms. Full rotating fairlead and wide, long and tapered end crawler mountings for ample bearing and superior performance in soft material are other features claimed for the dragline.

The New Bucyrus-Erie 38-B Excavator With Shovel Attachment

As a crane the 38-B provides long booms with optional jib extensions, a two-clutch-operated independent boom hoist with full power control for raising and lowering, and optional independent two-speed propelling mechanism. It is claimed that in a recent extensive field test, one of the new 38-B shovels matched the cycle speed of a much smaller machine.

Pump Housings

WHAT is claimed to be an entirely new feature in portable self-priming centrifugal pumps for drainage work—the use of overall housings which protect both the engine and pump from weather and dirt—has been announced by the Jaeger Machine Company, Columbus, Ohio. These housings keep the spark plugs, carburetor and crankcase free of water and are said to insure quick starting and more efficient operation, and to add to the life of the engine. Side panels in the housing permit ready access to all parts of the engine and pump. On the larger units the housings provide room for inspection and adjustment of the engine. The pump ends of the housings are hinged to permit them to be swung completely open.



A Jaeger Pump with Overall Housing

In addition, this company has combined "inherent" priming action with "jet" priming in its pumps, two independent actions which operate simultaneously, thereby, it is claimed, insuring quick and sure priming. Renewable liners or seal rings; Jaeger patented Lubri-Seal, which is accessible for inspection; self-cleaning shell design and open-type impellers which are adjustable for wear; are other new features of the Jaeger line of drainage pumps.

What's the ANSWER?

Placing Riprap by Hand

What are the advantages of placing riprap by hand, compared with merely dumping it? The disadvantages? Why? Does the size of the stone make any difference?

Study Should Be Made

By L. R. Lamport
Assistant to Chief Engineer, Chicago & North Western, Chicago

Both the size of the riprap to be used and the method to be employed in placing it, should be determined by a thorough study of the conditions that make its use necessary. In most instances, however, riprap placed in rough courses by hand is considered to be more effective than the same material merely dumped into place. There is also an added economy in the amount of material required when it is placed by hand. Trenching at the toe of the slope frequently becomes necessary to prevent undercutting, and riprap should preferably be placed by hand in these trenches. Grouted riprap surfaces require placing of the material by hand to reduce the amount of grouting required, as well as to produce a uniform face.

Probably, the chief disadvantage of placing riprap by hand is the expense of doing the work. In the case of small stones, only additional labor is required, but with blocks of derrick size, a crane or derrick is also necessary, which may mean the added expense of a work train for placing as well as for unloading, unless off-track equipment can be made available for handling the stones.

Where the stream parallels the embankment and a swift current is encountered, the use of heavy riprap dumped at random along the slope, from the toe to a point well above high-water mark, tends to break up the current along the bank, forcing it to the center of the stream. On the other hand, material placed by hand may permit the main current to remain undisturbed and thus continue its cutting action beyond the ends of the area protected by the riprap.

The size of the stone to be used will depend in large measure upon the conditions that are to be overcome, being usually governed by the velocity of the current and the volume of the water. For grouting, it is generally preferable to use riprap of the one or two-man size. This is true also of the fascines where they are placed in wire netting. On some jobs, the availability of the equipment that will be needed to handle large stone may have a bearing on the size to be used.

Resists Erosion

By G. M. O'Rourke
Assistant Engineer Maintenance of Way, Illinois Central, Chicago

Riprap that has been placed carefully by hand, interlocked, either plain or grouted, resists erosion and wave wash. It affords no place for the accumulation of any debris that will retard free flow, and saves stone, compared with stone dumped at random on the same slope. Riprap that has been placed carefully by hand, with the lower edge below the wave-wash line and the top level with, or a few inches above, the top of rail, has saved track that otherwise would have been cut to pieces.

The only place where merely dumping riprap can be justified, is in a gully or a gash in an embankment where the purpose is to check erosion. If the wash is of any magnitude the top source or layer of stone should be

---

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered in May

1. *To what extent is there a field for mechanical devices that can be employed for renewing ties? What features should they possess?*

2. *What is the best way to clean out downspouts that have become filled with ice? What other methods are effective?*

3. *When laying rail what details should be given attention to insure that the correct expansion allowance will be provided and maintained? What is the relative importance of each?*

4. *What benefits are derived from metal nosings on bridge piers? Under what conditions should they be provided? What are the relative merits of steel rails and angles for this purpose? How can they be anchored?*

5. *What, if any, special precautions should be taken in maintaining track during alternate thawing and freezing? Does the speed of trains or the volume of traffic make any difference?*

6. *How can the intakes of suction lines be kept free of ice during low temperatures?*

7. *What shape should the ballast shoulder be? How wide? Do these differ for different kinds of ballast? Does the length of the ties make any difference?*

8. *Can salt or calcium chloride be used for removing snow and ice from platforms? What are the advantages? The disadvantages? What other methods are satisfactory?*

placed by hand. The only disadvantage, if it may be called that, of placing riprap by hand is the additional cost. Stone smaller than one-man size cannot be placed by hand, either economically or effectively.

To resist erosion effectually, both volume and weight are required. Derrick-sized stone should be placed carefully and grouted. The Chicago Park Board, after years of experimenting with "dumped" stones, which were quickly torn down by wave action, is now placing the stone carefully and then grouting it.

Depends on Foundation

By G. S. Crites
Division Engineer, Baltimore & Ohio, Baltimore, Md.

Both the size of the stone to be used as riprap and the way it should be placed depend almost entirely on the foundation that can be obtained, together with the currents that are encountered or expected. Along a rocky seacoast or at the sides of rocky submerged valleys, cut stone of large size, placed carefully by hand and well secured, will withstand strong tidal and current action. But protection of this sort would be foolish unless it were founded on solid rock.

On sandy or alluvial shore lines or river banks it is best to dump large-sized stone and allow the tide or current to settle them until they are solidly in place. Whether hand-placed riprap or large stones dumped at random will be used to maintain the upper part of such walls will depend upon several factors. If stone quarries are remote and an ample supply of wash boulders is near at hand, it will probably be economical to grout hand-placed boulders in place to form a protective blanket. However, if large stones are available from quarries or from the sides of cuts close to the protection work, they will do the job, provided they are dumped intelligently. Care must be taken, however, to avoid allowing the larger stones to roll away from the wall to positions where they might cause eddies that would cause disturbances.

There are places where alluvial valleys are up-grading and, in most such cases, it is reasonable to expect that the stream bed will not cut down, provided the established stream width is not restricted. High water does the washing in most instances of this nature and if the banks are blanketed with hand-placed grouted riprap, they should not wash. On the other hand, if the roadbed encroaches on the old stream bed in valleys of this character, it can be expected that, at points of restriction, high water will cut deep under any riprap bank protection. For this reason, such embankments should be protected with large stones dumped at the bottom and random riprap should be used above the big stones.

Better to Place

By L. G. Byrd
Supervisor of Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

Riprap is used most generally for bank protection, especially at bridges, to prevent scouring of embankments, although it is also used widely to prevent damage from wave action along lakes, reservoirs and tide-water exposures. If used where the current is swift, a trench should be cut at the toe of the slope and the riprap should be placed carefully by hand to form a wedge. The face should be made as smooth as possible to prevent drift or other debris from accumulating against it.

Riprap is usually furnished in sizes weighing from 30 to 80 lb. It will require less material and give better protection if placed by hand, than if dumped at random. It often becomes advisable to grout the stones in place after they have been laid to prevent the possibility of water working in behind the riprap, thus causing individual stones to move. The tighter the riprap is sealed, the better the protection and the longer the service it will give. It is practically impossible, however, to place riprap by hand if it has been dumped into the water along creek or river banks. Where dumping is done under these circumstances, the riprap should consist of very large stones.

From Canted to Flat Tie Plates

Where canted tie plates are in service, can they be continued through turnouts and railway crossings? If so, how is this done? If not, why? Where should the transition from canted to flat plates take place? What are the advantages?

Avoid Abrupt Changes

By A. F. Huber
Chief Engineer, Ramapo-Ajax Division, American Brake Shoe Company, Chicago

Standard tie plates are canted to slope the top of the rail head to conform to the contour of new or average worn wheels, and thus to distribute the weight of traffic over as wide an area of the running surface as possible. The continuation of this slope through turnouts and crossings is desirable, but this is not a simple problem, because it involves not only special means for the support of the structures, but also the correct location of the tread surfaces, and each special track structure should be analyzed carefully to insure best results.

In switches, it is not difficult or too expensive to cant the stock rails by designing sloped rail seats in the gage, slide and heel plates. However, canted risers under the switch points will increase the power required to throw them and to hold the closed point against its stock rail. Hence, vertical switch points are generally preferred.

Canting running rails at guard rails is desirable, because a uniform tread surface is then provided for the wheels. A number of satisfactory designs for this are in general use, such as manganese one-piece and assembled-rail types, both being furnished with canted seats under the running rail. A single long tie plate, rolled with a canted seat and an inside shoulder for the running rail is also available and is used widely.

In turnout frogs and railway crossings, horizontal tread surfaces are used commonly, because sloped surfaces at frog points and wings, and at crossing corners, would increase the unsupported portion for the intersecting traffic and thus lengthen the gap or jump at the flangeway intersections. Sloped rail seats in the tie or base plates would be expensive, as would the special fillers and other appurtenances in the body if canted rails were used throughout.

A patented design introduces a twist in the rails at the heel and toe ends of frogs and the external arms of crossings. The length of the twist is equal to approximately one-half the joint-bar length, and thus these rails are alined accurately to the connecting canted rails. The design is also applicable to the heel end of switch points. Other designs permit vertical joints at these places and use flat tie plates on several ties beyond the joint, thus removing the transition away from the joint.

In general, it is deemed advisable to avoid abrupt changes in the rail supports, though the transition from flat to standard 1 in 40 cant is not severe on the rail and ties, provided it does not take place in the joint ties or at the head-block tie of switches.

Not Too Much Cant

By W. H. Sparks

General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

There are a number of reasons why canted rail through frogs and railway crossings is not desirable. However, the problem presented by canted rail through these structures is as much or more of a manufacturing problem as it is one of maintenance or use. An effort to reduce wear on the rail is responsible primarily for canting rail, but a reduction in this wear is secondary to the difficulties that may be introduced by canting the rail through these structures, particularly where cants of 1:20 or steeper are in use. I believe, however, that a moderate cant through switches is feasible and that this cant can be maintained without too much difficulty, although the switches will be harder to throw, and more attention must be paid to keeping the point tight against the stock rail.

Obviously, too sharp a twist in the rail in making the transition from canted to flat plates is undesirable. However, the difference between a flat plate and one that is canted 1 in 40 is not very great and I believe that the transition from one to the other does not stress the rail unduly. I am not so sure, however, about the transition from a plate canted 1 in 20 to the flat plate. It should be noted here, however, that it is a practical impossibility to apply and maintain plates of intermediate cant to make the transition smoothly.

Information on Foundations

Preparatory to construction or replacement, what information should be obtained with respect to foundations for piers and abutments? For concrete boxes? Pipe culverts? How should it be obtained?

Three Methods Available

By S. F. Grear

Assistant Engineer of Bridges, Illinois Central, Chicago

There are three methods of exploration available—by means of borings, by test piles and by digging holes to plan depth. Borings are always advisable since they give a log of the materials for a considerable distance below the foundation and will indicate particularly the elevation of rock. Such borings do not, however, give the designer complete information as to the bearing power of the soils. Generally, they will disclose whether pile foundations are necessary and give an indication as to the length of piles needed. These borings are especially useful in determining the depth required for cofferdam sheeting for piers and abutments, and to insure that piles are not stopped above a soft stratum.

Where borings indicate the possibility of building on natural foundations other than rock, it is possible in many instances to excavate a small hole to determine the exact nature of the foundation or the exact depth of a good foundation. In some cases, however, such exploration is prevented by water conditions. When borings do not give close information as to the length of the piles needed, it is advisable to drive test piles. This is of particular importance where expensive treated piles are to be used. When there is considerable soil above the foundation, test piles may not give full information. If a supply of piles is available for prompt shipment, it is possible to excavate to plan depth and then drive the test piles to determine the suitable length.

A reasonably good foundation is required for concrete boxes, but the load per square foot is about the same as, or a little less than, the load from the surrounding fill. If suitable material is found, it should be necessary to bore for a short distance only, or to drive a bar to insure against building on a thin stratum of good material that is underlaid by soft material.

Find Supporting Capacity

By H. Austill

Chief Engineer, Terminal Railroad Association, St. Louis, Mo.

The theory has often been advanced that where a second or even a third bridge is being supported on piers that were built to carry much lighter loading this is evidence that the original foundation was extravagant. While this is something to consider, an unstable foundation may lead to disastrous results. The center pier of a swing span over which I once had supervision, was found to be leaning upstream. All available information indicated that the pier was supported on rock. An examination disclosed, however, that while the pier actually rested on rock, it was a limestone stratum that was softer than the masonry in the pier. Sand transported by the swift current of the stream had eroded the rock from under the upstream half of the pier. Repairs cost enough to offset a considerable amount of extravagance in the original construction.

Preparatory to the construction of a pier or an abutment, the primary things to determine are the supporting capacity of the material upon which the structure is to rest and the probability of future changes in the present conditions by reason of scour, nearby excavations, changes in the ground-water level and other similar causes.

Unless the foundation is known to be rock, it should be examined by borings, test pits, test piles or test loading to determine its supporting capacity. This having been done, a survey or obesrvation of surrounding conditions should be made to ascertain the probability of future changes.

When a pier or an abutment is to be replaced, an opportunity will be afforded for examination and exploration when the existing structure is razed, in much the same way as an investigation is made for the construction of a new structure.

Many old abutments and retaining walls are leaning away from the backfilling because the supporting capacity of the foundation along the toe of the wall has been exceeded. The foundation might have been perfectly good for the average load per square foot, but the load along the toe of the wall or abutment is not an average.

A somewhat difficult problem arises where a bridge is to be rebuilt and the original foundation and piers seem to be adequate and in condition to support the new superstructure. Where the original plans and specifications are not on hand and known to have been followed, or where there is any question at all as to the supporting capacity of the foundation, perhaps the best procedure is to sink a test pit alongside the foundation, as in most cases even when men who were connected with the original construction can be found, their memory is not to be trusted implicitly. I once found a stone pier that was thought to be founded on solid rock. A test

pit alongside it disclosed that it was merely resting on a rock shelf, underneath which there were several feet of muck over solid rock.

Usually, an examination of the ground will give all of the information necessary for the location of culverts, both of the box and the pipe types. The possibility of settlement, damage by scour, filling with earth or debris, and of being undermined by water working along underneath it are the principal things to keep in mind and guard against.

Ventilating Attics

Is it desirable to provide means for ventilating attics in railway buildings? Why? How should this be done? What precautions are desirable?

There Are Advantages

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

There are advantages in providing ventilation for attics in frame buildings, especially in buildings in which the ceilings are insulated. Ventilation can be obtained by installing louvres in the gables, and their size will depend on the size of the building and the number of louvres installed. The importance of installing ventilation in buildings when insulation has been applied on the walls and ceiling lies in the desirability of eliminating the condensation of moisture which would cause damage to structural members as well as to the insulating material, if the insulation is not waterproof.

The louvres should be covered on the inside with small-mesh screen wire to prevent birds from building nests inside the attic or carrying flammable material inside. The slats of the louvres should be set at such an angle that they will prevent rain from blowing in or birds nests lodging in them.

There are few railway buildings in southern states in which insulation has been applied for the purpose of tightening the building or holding the heat, and I do not see any particular advantage in providing ventilation for the attics of buildings that are without insulation. We have not provided ventilation openings in attics of brick and stone structures constructed in recent years, and as to the saving in fuel and power cost, it has not been determined that there is any difference whether the buildings were ventilated or closed tight.

Consider It Desirable

By General Inspector of Buildings

Any metal stone or wood surface exposed to the sun on a hot summer day attains a temperature higher than that of the atmosphere and, if such a surface comprises a roof that is poorly insulated or not insulated at all, the heat from the roof surface is communicated to the air in the attic beneath it. If this attic is closed at the ends the confined air tends to attain a temperature equal to that of the roof surface.

Unless the attic space is provided with some sort of openings which will permit circulation of this confined air, through either convection currents or wind pressure, this air will attain a temperature much higher than that of the atmosphere and this heat will flow into the rooms below, causing serious discomfort to the occupants. The remedy is to provide ventilation, the important requirement being that the ventilation openings be placed in such positions that they take advantage of the circulation brought about by convection currents or wind pressure, and that they be so designed that they will keep the rain out, even when it is driven at a flat angle. If the building is in a cold climate it may be desirable to close the openings in the winter.

Illustrating the importance placed on ventilation in some quarters, it is pointed out that in Arizona and Southern California, where the heat of the desert gets very high, many buildings are constructed with false roofs, that is, a second roof is supported a foot or more above the normal roof so that the air is free to flow and circulate between the upper and lower roofs.

Confined Air Detrimental

By V. E. Engman
Chief Carpenter, Chicago, Milwaukee, St. Paul & Pacific, Savanna, Ill.

In buildings of permanent and tight construction, where the ceiling is enclosed entirely, it is desirable to provide some means for ventilating the attic. Confined air may become contaminated and detrimental to health; and it may also propagate fungi to the detriment of the building. In buildings with gable roofs, the ventilation can be best provided for by introducing louvres at each end. In pyramid or hip roofs, a ventilator is provided in the roof. In either case the openings in the louvre or in the ventilator should be covered with a screen to prevent the entrance into the attic of birds and insects.

Heating Concrete Aggregates

Is it desirable to heat aggregates for concrete in cold weather? Between what temperature limits? How is it done? What precautions should be observed? Should the mixing water be heated also? Why? To what temperature?

Should Be Heated

By Supervisor of Bridges and Buildings

My experience indicates that the depositing of concrete in cold weather should be avoided wherever possible, yet it is often necessary to place large amounts of winter concrete to avoid serious delays to important work. Wherever it becomes necessary to place concrete in cold weather, the aggregates should certainly be heated.

When we first began to use concrete on a scale large enough to justify placing it during the winter months, we obtained a section of a dismantled steel smoke stack, placed it at the desired point and unloaded our aggregates over it. In preparation for the mixing of the concrete we built a lively fire in one end of this pipe. We soon found, however, that there was a serious disadvantage in this method, for, if we built enough of a fire to heat the amount of aggregates needed to keep the work going, those adjacent to the pipe became too hot, while those at some distance were scarcely warmed.

To overcome this undesirable situation, we laid grids of steam lines under the pile of aggregates and tried heating by steam. In one respect this was an improvement, compared with the direct heat from the fire, because none of the aggregates became

overheated. By the same token, however, the total volume of aggregates that could be heated was less than before, unless we kept steam in the pipes during the night as well as during the working period. Furthermore, those aggregates that were exposed to the prolonged heating were inclined to dry out too much, sometimes upsetting our calculation as to the amount of mixing water that is required.

Later we used perforated steam lines, allowing a small volume of steam to escape constantly into the pile of aggregates. This gave still better results, because there was no injury to the materials, while the area subjected to the heating was much greater. With this method, however, it became necessary to take account of the moisture introduced into and absorbed by the aggregates when calculating the volume of mixing water to be used. The mixing water should be warmed only slightly; the use of water that is too hot, along with the heated aggregates, might cause the cement to set too quickly.

Avoid Overheating

By General Inspector of Bridges

Concrete cannot be manufactured successfully from cold aggregates, cold mixing water and cold cement, because the chemical reactions which change these loose materials into stone, either do not take place or are not completed. The reactions which cause this change require a certain amount of heat to enable them to take place and to continue to completion. While these reactions themselves generate considerable heat, they require exterior warmth to get them started and, generally, to keep them going. On the other hand, too much heat, especially too high a temperature, will accelerate the reactions to the point where they become violent enough to destroy the concrete.

One of the important precautions that must be taken is to insure that the aggregates are not overheated. Overheating may damage the material to the extent that it cannot make sound concrete, and also tends to dry out the aggregates to the point where they absorb too much of the mixing water, generally regardless of the fact that the amount of mixing water has been calculated carefully on the basis of the assumed moisture content. Steam does not overheat the material or cause it to dry out; in fact, we sometimes have trouble because of too much moisture where steam has been allowed to permeate the pile of aggregates for any period of time.

It should not be assumed that the aggregates arrive in the mixer at the temperature at which they are taken from the pile, and this temperature of delivery will decrease as the atmospheric temperature drops. What we desire particularly is that there be sufficient heat to permit the necessary chemical reaction to get started and to continue to completion without becoming violent at any time.

Added Inspection for Rail

Should section foremen be required to make a detailed inspection of rail for indications of approaching failure on lines over which detector cars are operated? Why? If so, how often and in what detail?

Foremen Should Inspect

By B. Blowers
Engineer Maintenance of Way, Erie, Youngstown, Ohio

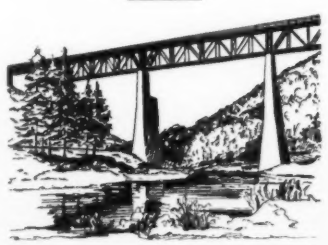
If detector cars are operated at suitable intervals, which will depend on the amount and class of traffic, and the condition of the rail, most of the defects that lead to rail failures will be discovered by the detector car. However, since there are some types of rail failure that the detector car does not discover or identify correctly, because of influences outside the rail itself, I consider that the section foreman should also make an inspection of the rail, between trips made by the detector car, for indications of approaching failures. The car does not always give indications of breaks in the base of the rail, which occur as a result of being struck by a hammer, or from other causes. It does not detect small partially developed vertical splits in the rail heads, or failures within the limits of the joint bars.

Again, rails with head and web separations may not be so designated by the motor-car operator, owing to the presence of high spikes or other causes which affect the indications shown by the detector car. Also, there are types of rail failures that develop between the trips made by the detector car, such as engine burns and fractures, base breaks, breaks through bolt holes, head and web separations in road crossings and on curves, as well as from other causes.

I do not believe that any definite interval between rail inspections by the section foreman can be established, because track and rail conditions are the governing factors. On well-maintained lines, with the rail in good condition, a visual inspection, say once a week, from a slow-moving motor car may be all that is necessary, aside from detailed inspection of rails at grade crossings and in stretches of track where numerous failures have occurred, and a search for head and web separations of rail on the low side of curves, which is becoming thin.

The interval between detailed inspections of rail through crossings to determine whether head and web separations are present, may range from a month up to six months. This inspection should be made with the aid of a hammer or by removal of materials immediately adjacent to the rail, so that the condition of the rail underneath the head can be observed. The inspection for possible head and web separations on curves should be made either with a mirror or by direct observation underneath the head. The interval between these inspections depends upon the degree of curvature, the type and density of traffic, the thickness of the rail head and on ballast and tie conditions.

Some problematical failures are picked up by a detector car. These consist in part of slight burns caused by slipping drivers and small horizontal splits in the rail heads. Rails of this type should receive special inspection by the section foreman at frequent intervals.



Inspection Is Needed

By Harlow Hart
Chief Clerk, Pennsylvania, Huntertown, Ind.

Both my experience and observation lead to the conclusion that foremen should make an inspection of the rail on their sections shortly after alternate freezing and thawing weather is past regardless of whether

the detector car has just made an inspection or is due to make one soon. This type of weather, combined with the heavy axle loads of modern locomotives and cars, is extremely hard on rail. As a result, it is quite certain that a number of vertical split heads and broken bases will show up, and some broken ends will also be found.

If the foreman will assign enough men to make a "hands and knees" inspection, and will remove all rails thus discovered to be defective, this will not only remove the probability of serious derailments, but will also speed up the inspection to be made by the detector car on its next trip.

At Intervals of 30 Days

By J. C. Rouse

Extra Gang Foreman, Southern Pacific, Centerville, Cal.

Not all of the defects that lead to rail failures are discovered by the detector car, for which reason the foreman should not assume that he will be free from rail failures because the detector car has been over his section. Particularly, head and web separations are seldom recorded by the detector car, but must be observed visually. In general, the defects that are recorded by the detector car are in the head, most particularly transverse and other internal fissures, neither of which are visible until the failure actually occurs. Rails that have been transposed on curves and where the ties have been adzed to correct the gage or cant the rail are prone to develop cracks in the fillet between the head and web and to fail eventually. This rail should be inspected carefully at least every 30 days either by the use of mirrors or by direct visual inspection.

When checking gage or curve elevation, foremen, trackwalkers or other inspectors should pay particular attention to the condition of the web and base of the rail and should also watch carefully for piped or split heads or for breaks resulting from sudden ruptures. As mentioned, there are a variety of defects that are not recorded by the detector car, and still others which can be detected by eye and which should be looked for. Foremen should make every effort to discover all visible defects and thus eliminate the cause for derailments, since there are only a limited number of types that cause signals to go to stop position and this happens only after the rail is severed.

Hard-Riding Frogs

What causes a frog to ride hard? What can be done to prevent it?

Good Maintenance Prevents

By W. H. Sparks

General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

While spring frogs will ride "hard" under some conditions, by far the greater trouble of this character is experienced with rigid frogs. Manufacturers have not yet been able to make either open-hearth or manganese-steel frogs that will not in time become worn to the point that they become rough riding despite all efforts to prevent it, even where the ties, the ballast and the drainage are well maintained. This will happen particularly, and incidentally prevent the best results, even from high-grade maintenance, if the frog bolts are allowed to get loose. It is elementary that frog bolts must be kept tight if best results from other forms of maintenance are to be obtained from frogs.

The principal reason why frogs become worn across the point and through the throat is that worn wheel flanges and worn wheel treads are operated over them under heavy loads and at high speeds, so that the frogs themselves are subject to high impact by the worn wheels. Many wheel treads are worn until they have a groove next to the flange which in turn may also be worn. In such cases, the outer part of the wheel tread is higher than the area next to the flange. This creates a condition that will result in severe wear on the frog and make it ride rough, and which nothing but building the frog back to its original section will overcome.

When one considers the density and weight of traffic passing over the rails today, it comes as no surprise that frogs, even of manganese steel, wear more rapidly than frogs of less sturdy construction did a few years ago under the lighter wheel loading and the less concentrated traffic of the period. Despite clean ballast, well-maintained line, surface and gage, the wear alone that frogs receive is enough to make them ride hard or, as I prefer to phrase it, rough. Obviously, spring frogs will wear much more slowly than rigid frogs, provided they are maintained to a high standard.

What can be done to prevent the trouble? There is no reason of which I am aware for leaving frogs in the track until they become a nuisance. While wear cannot be prevented, it should not be allowed to progress to the point where the frog becomes badly worn. It will be better for the frog, with respect to its service life, for the track man and for the wheels that must pass over it, if repairs are made while the wear is still of minor, rather than major, proportions. One broken wheel will pay for a lot of frog repairs.

Better Maintenance

By Supervisor of Track

While correct design is a factor of major importance in the smooth riding of frogs, in general this may be dismissed from consideration, since modern frogs are the product of intensive and extended study on the part of both manufacturers and maintenance engineers, covering a period of a third of a century. This, then, leaves for consideration only the matters relating to installation and maintenance.

Correct installation for frogs has increased in importance of late by reason of the marked increase in train speeds which has characterized railway operation during the last decade. On the other hand, the knowledge of trackmen with respect to the requirements of installation has generally kept pace with these requirements, so that we can assume that this factor is also eliminated from our study.

This leaves only maintenance as a subject for inquiry and, as a matter of fact, maintenance is generally at fault when a frog does not ride smoothly. Assuming, first, that the frog is not worn and is in good surface, the principal reason for riding hard is faulty alinement through the turnout and frog. This may result from incorrect gage, particularly through the guard rail, to crowding of the equipment going through the turnout side of the frog or to rail creepage. Conversely, even though the gage, the surface and the alinement

are correct, a badly-worn frog will ride hard.

It is evident, therefore, that to maintain good-riding frogs, equal attention must be given to gage, alinement and surface, and that wear must be kept to the minimum. In other words, the method of building a frog back to its original section has now been developed to the point where there is no longer any excuse for allowing a frog to become worn to the point where it can no longer be made to ride smooth.

Another item of importance in this connection is the width of the flangeway between the running rail and the guard rail. The standard width of flangeway is designed for use with track of correct gage. If the gage at the frog is wide and the guard-rail flangeway is of standard width, it will tend to pull the wheels out of line and away from the frog. Obversely, if the gage is narrow the standard width of flangeway allows the wheels to run too close to the point of the frog, with consequent rough riding.

Has Many Causes

By G. S. Crites
Division Engineer, Baltimore & Ohio, Baltimore, Md.

When a frog is low, out of gage, worn or has incorrect openings in the flangeways of either the frog or guard rail, it will ride "hard." All such conditions should be guarded against by periodical inspections by the foremen and supervising officers. There is no place in the track structure where the old saw that "a stitch in time saves nine" applies with more force than to frogs. The gage, line, surface and width of openings should be kept strictly in accordance with the standard at all times and wear should be taken care of by welding before it takes much metal to bring the frog back to true section. Badly-worn frogs should be renewed rather than welded, and the old frogs, if worth it, should be used where less important and slower traffic is carried.

Wheels with worn flanges or treads will ride hard over good frogs. There is only about 3/8-in. leeway between the allowable back-to-back distance of flanges and correct guard-rail spacing. Vertical flanges will, therefore, allow the backs of flanges to hit the guard rail or the guard of the frog, giving the effect of the frog riding hard. Worn or troughed treads will cause the rims of such wheels to ride on top of the frog, causing the wheels to bounce up a distance equal to or greater than the depth of the trough.

Solids in Boiler Waters

When referring to the solids in boiler waters, what is the relation between grains per gallon, pounds per thousand gallons and parts per million?

Gives Metric Relationship

By J. J. Landig
Research Engineer, Delaware, Lackawanna & Western, Scranton, Pa.

The relationship between pounds per 1,000 gal. and parts per million is as follows:

1 grain per gal. equals 1/7 lb. per 1,000 gal., and this in turn equals 0.0583 parts per million.

1 part per million equals 2.44 lb. per 1,000 gal., and this equals 17.1 grains per gal.

These figures are based on the following relationship:

1 lb. equals 7,000 grains
1 liter equals 1,000,000 milligrams
1 part per million equals 1 milligram per liter

Not Too Complicated

By Water Chemist

The expressions given in the question refer to different ways in which chemists record the amount by weight of a substance contained in a certain volume of water. From this it follows that an analysis of a water expressed in grains per gallon means that there are so many grains of the substance in every gallon of water considered. Likewise, an analysis expressed in parts per 100,000 means that there are so many grains of the substance in 100,000 cubic centimeters of water, and when expressed in pounds per 1,000 gal., that there are so many pounds of it in every 1,000 gal. of the water.

Since these analyses are all ratios of the weights of substances to volume of water, one may be expressed in terms of the other once the relationship is determined. Remember that there are 7,000 grains in a pound and that there are 58,349 grains in a gallon of water at 62 deg. F.

To convert grains per gallon to pounds per 1,000 gal., divide the number of grains in 1 gal. by 7.

To convert pounds per 1,000 gal. to grains per gallon, multiply the number of pounds by 7.

To convert grains per gallon to parts per 100,000, multiply the grains given by 1.71.

To convert grains per gallon to parts per million, multiply the grains by 17.14.

To convert parts per 100,000 to grains per gallon, divide the parts shown by 1.71. Likewise to make the conversion from parts per million to grains per gallon, divide by 17.14.

To convert pounds per 1,000 gal. to parts per 100,000 multiply the pounds by 12; or to parts per million multiply by 1.2.

To convert parts per 100,000 to pounds per 1,000 gal. divide the parts by 12. If the conversion is to parts per million, divide by 1.2.

Gives Conversion Factors

By Engineer of Water Service

The mineral content or the solids contained in boiler waters may be expressed in parts per million, parts per hundred thousand or in grains per gallon, as well as pounds per thousand gallons. The first two methods of expression are convenient where laboratory operations are under the metric system. Most railway chemists and water engineers use grains per gallon to express the solid content of boiler water, however, because it simplifies the calculations somewhat and is sufficiently accurate for all practical purposes. One part per million equals 17.14 grains per gallon. To change the figures of an analysis given in parts per million to grains per gallon, multiply by 5.84, or, to obtain an approximate figure, multiply by 6.

Regardless of the method employed in expressing the mineral content of a boiler-water analysis, it is not always clear to a non-technical man or to one who is not familiar with terms used in chemistry.

There are 58,349 grains in a gallon of water at 62 deg. F., for which reason it becomes difficult to visualize a single grain. A better conception of the solids carried by a water may, therefore, be gained if it is expressed in pounds per 1,000 gal. Since there are 7,000 grains in an avoirdupois pound, 7 grains per gallon represents 1 lb. per 1,000 gal. For example, if a 100,000-gal. tank is filled with a water containing 7 grains of incrusting solids per gallon the total solids in the water amount to 100 lb. If a locomotive takes 15,000 gal. of this water, a total of 15 lb. of incrusting solids has been introduced into the locomotive tender.

Changes in Railway Personnel

General

F. P. Sisson, chief engineer of the Grand Trunk Western, at Detroit, Mich., has been appointed engineering assistant to the general manager, with the same headquarters.

F. M. Rutter, assistant to the general superintendent on the Canadian Pacific, at Vancouver, B. C., and an engineer by training and experience, has retired, after more than 43 years of railway service.

W. J. Martin, chief engineer and industrial commissioner of the Northeast Oklahoma, at Miami, Okla., has been promoted to chief engineer and assistant to the president, with the same headquarters.

John Edwards, Jr., superintendent of the Akron division of the Baltimore & Ohio, and an engineer by training and experience, has been promoted to assistant general superintendent of transportation, at Baltimore, Md.

Charles H. Buford, vice-president of the Operations and Maintenance Department of the Association of American Railroads, at Washington, D. C., and an engineer by training and experience, has been appointed executive vice-president of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Chicago.

F. Berkeley Robins, formerly director, Transportation Equipment division, War Production Board, and more recently assistant general supervisor of bridges and buildings of the Chesapeake & Ohio, with headquarters at Richmond, Va., has been appointed staff assistant in the office of the president of the Atlantic Coast Line, with headquarters at Wilmington, N. C.

Engineering

Ray Stephens has been appointed engineer maintenance of way of the Toledo Terminal, succeeding **F. J. Bishop,** who has resigned to accept employment with another company.

L. G. Shriver, assistant to the system maintenance engineer of the Union Pacific at Omaha, Neb., has been appointed assistant to the chief engineer, with the same headquarters.

L. H. Laffoley, assistant engineer of buildings on the Canadian Pacific, at Montreal, Que., has been promoted to engineer of buildings there, succeeding **N. B. Reardon,** who has retired.

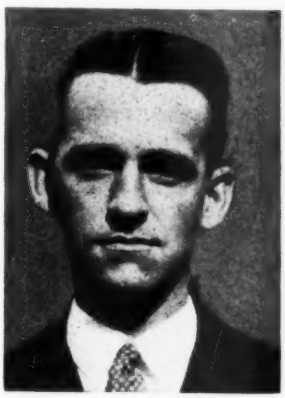
K. L. Moriarity, superintendent on the Denver & Rio Grande Western, at Salt Lake City, has been promoted to assistant chief engineer of the system, with headquarters at Denver, Colo.

G. L. Plow, assistant division engineer of the Laurentian division of the Canadian National, has been promoted to division engineer of the Ottawa division, at Ottawa, Ont., succeeding **W. E. Griffiths,** who has been transferred to Montreal, Que., replacing **H. K. Morrison,** who has been advanced to district engineer at Montreal. Mr. Morrison succeeds **H. E. Smith,** whose death is reported elsewhere in these columns.

William H. Eiker, division engineer on the Chicago, Burlington & Quincy, at Lincoln, Neb., will retire on March 15, after forty years of service, 35 of which have been as division or district engineer.

E. J. Zapfe has been appointed assistant chief engineer of the Green Bay & Western, the Kewaunee, Green Bay & Western and the Ahnapee & Western, with headquarters at Green Bay, Wis.

W. L. Young, whose promotion to principal assistant engineer of the Norfolk & Western, at Roanoke, Va., was reported in the January issue, began work in the drafting room of the Virginia Bridge & Iron Company in June, 1918, and later served several years as draftsman, designer and construction engineer for the Atlantic



W. L. Young

Bridge Company, Greensboro, N.C. He entered the service of the Norfolk & Western in February, 1924, as a draftsman, and designed many important structures and grade crossing elimination projects. On October 16, 1930, he was promoted to crossing engineer, and in October, 1941, he was advanced to bridge engineer, which position he held until his recent promotion.

F. E. Short has been appointed acting division engineer of the Northern division of the St. Louis-San Francisco, at Ft. Scott, Kan., succeeding **H. W. Smith,** who resumes his former position as assistant engineer.

J. Cherrington has been appointed division engineer on the Canadian Pacific, at Penticton, B.C., succeeding **W. G. Dyer,** whose promotion to engineer of track of the system, at Montreal, Que., was reported in the January issue.

J. J. Clutz, formerly an engineer with the Washington Terminal Company, and who now returns from military service, has been appointed division engineer in the office of the chief engineer of the Eastern region of the Pennsylvania, at Philadelphia, Pa.

B. E. Crumpler, whose promotion to assistant engineer, Eastern General division of the Norfolk & Western, at Roanoke, Va., was reported in the January issue, was born on May 8, 1905, at Bluefield, W.

B. E. Crumpler

Va., and entered the service of the Norfolk & Western in January, 1926, as a student chainman. In the following month he was promoted to draftsman, thereafter serving alternately in this position and as a transitman. In 1942 he was advanced to maintenance engineer, with headquarters at Roanoke.

J. F. Newsom, Jr., whose promotion to maintenance engineer of the Norfolk & Western, at Roanoke, Va., was reported in the January issue, was born at Norfolk, Va., on October 9, 1901, and was graduated in civil engineering from Virginia Polytechnic Institute in 1923. He entered railway service on June 16, 1923, as a rodman in the engineering department of the Nor-

J. F. Newsom, Jr.

folk & Western, later being advanced to inspector and transitman at Bluefield, W. Va. On August 1, 1926, he was promoted to draftsman at Roanoke, and on October 1, 1941, he was advanced to resident engineer, with the same headquarters, which position he held until his recent promotion, effective December 1.

William J. Govett, valuation engineer of the Chicago, Rock Island & Pacific at Chicago, has been appointed acting engineer of capital expenditures, with the same headquarters, succeeding **Charles P. Richardson,** who has been appointed terminal engineer of the Chicago South Side Railroad Terminal Committee.

Harold C. Stull, who has been on military leave of absence to serve in the United States Army, 774th Railway Grand division, with which organization he attained the rank of major, has resumed his position of senior assistant division engineer of the Rio Grande division of the Southern Pacific, at El Paso, Tex.

F. P. Turner, whose retirement as principal assistant engineer of the Norfolk & Western, at Roanoke, Va., was reported in the January issue, was born near Christiansburg, Va., on November 16, 1874, and was graduated in mechanical engineering from Virginia Polytechnic Institute in 1896. He entered railway service for the first time in 1899, when he was engaged for three months as a chainman on the Nor-

F. P. Turner

folk & Western. He was an instrumentman and draftsman on the Virginia & Southwestern (now part of the Southern) at Elizabethtown, Tenn., from 1899 to 1901, and then returned to the N. & W. as a masonry inspector. In 1903 he was promoted to asistant engineer on construction and served for 3½ years as assistant engineer on bridge, viaduct, tunnel and general double-track construction in the West Virginia mountains, after which he was occupied for 2½ years in charge of bridge construction at Norfolk, Va., and for 4½ years in charge of the construction of bridges and double track in Ohio. He was promoted to acting bridge engineer in May, 1913, and a year later was advanced to bridge engineer. Mr. Turner was promoted to principal assistant engineer on January 1, 1924.

Leo W. Green, assistant division engineer of the Middle division of the Pennsylvania, with headquarters at Altoona, Pa., has been promoted to division engineer of the Delmarva division, with headquarters at Cape Charles, Va., succeeding **Michael Lipman,** who has retired from active service. **W. H. Kendall,** supervisor of track at Wilmington, Del., has been advanced to assistant division engineer at Altoona, succeeding Mr. Green. A biography of Mr. Green was published in the October, 1945, issue following his recent promotion to assistant division engineer.

H. F. Smith, whose promotion to bridge engineer of the Norfolk & Western, at Roanoke, Va., was reported in the January issue, began railway service in

H. F. Smith

June, 1923, as a rodman on the Norfolk & Western, and became an inspector in October of the same year. In June, 1924, he was promoted to transitman, and three months later was advanced to draftsman. In May, 1935, he was moved up to resident engineer, and in October, 1941, was promoted to crossing engineer. Mr. Smith was advanced to assistant engineer, Eastern General division, on January 1, 1943, which position he held until his recent promotion.

J. W. Hayes, whose promotion to architect of the Great Northern, with headquarters at St. Paul, Minn., was reported in the January issue, was born at Port-

J. W. Hayes

land, Ore., on November 30, 1908, and received his higher education at the Oregon Institute of Technology and the University of Minnesota. He entered railroad service on April 6, 1929, as clerk and chainman on the Spokane, Portland & Seattle, at Portland. On August 13, 1936, he entered the service of the Great Northern as assistant to the master carpenter, and was promoted to assistant architect at St. Paul, Minn., on March 1, 1940, holding this position until his recent promotion to architect.

E. D. Flad, engineer maintenance of way of the Southwestern general division of the Pennsylvania, at Indianapolis, Ind., has been promoted to assistant to the chief engineer maintenance of way of the Western region, with headquarters at Chicago. **R. W. Speidel,** formerly division engineer of the Indianapolis division, at Indianapolis, and who now returns from military service, has been appointed division engineer of the Panhandle division, at Pittsburgh, Pa., succeeding **W. W. Boyer,** who has been advanced to engineer maintenance of way of the Southwestern general division, at Indianapolis, replacing Mr. Flad.

C. M. Nye, whose retirement as chief engineer of the Great Northern, with headquarters at St. Paul, Minn., was reported in the January issue, was born at Moline, Ill., and received his higher education at the University of Illinois. He entered railroad service in 1899 with the Chicago, Rock Island & Pacific. From

C. M. Nye

1906 to 1909 he was chief draftsman on the Chicago, Milwaukee, St. Paul & Pacific, and during 1910 he was with the Oregon Trunk. From 1910 to 1913 he served as office engineer with the Spokane, Portland & Seattle. Mr. Nye entered the service of the Great Northern in 1913 as principal assistant engineer at St. Paul, and served in that capacity until 1918, when he entered the armed forces. In 1919 he returned to the Great Northern as principal assistant engineer, with headquarters as before at St. Paul. Mr. Nye was promoted to assistant chief engineer in 1920, and served in that capacity until 1940, when he was further advanced to chief engineer, the position he held at the time of his retirement.

F. C. Knight, engineer accountant in the valuation department of the Canadian National at Toronto, Ont., has been promoted to valuation engineer of the system, with the same headquarters, succeeding **W. S. MacCulloch,** who has retired.

J. G. Begley, assistant division engineer on the Baltimore & Ohio, at Newark, Ohio, has been promoted to division engineer at Washington, Ind., a new position. Mr. Begley will have jurisdiction over

that portion of the line extending from Washington to E. St. Louis, Ill. **P. W. Elmore** remains as division engineer at Washington, with jurisdiction from "CW" Cabin, Cincinnati, Ohio, to Washington. **F. L. Thompson,** assistant engineer at Cincinnati, has been advanced to assistant division engineer at Newark, replacing Mr. Begley, and **C. E. Jackman** has been appointed assistant engineer at Cincinnati, succeeding Mr. Thompson.

James B. Akers, whose promotion to chief engineer of the Southern, with headquarters at Washington, D.C., was reported in the February issue, was born at Danville, Va., on March 16, 1884. He attended Danville Military Institute and Washington and Lee University, being graduated from the latter in civil engineering in 1908. Mr. Akers first entered railway service with the Southern in 1904 as an assistant supervisor of track on the Ashville division, later serving as levelman, transitman and assistant engineer. In 1911 he was advanced to engineer

James B. Akers

maintenance of way of the Middle district, with headquarters at Knoxville, Tenn., and in 1921 he was promoted to chief engineer of the Lines East, with headquarters at Charlotte, N.C. He was advanced to assistant to the vice-president in charge of engineering, with headquarters at Washington, in 1924, and in 1931 he was appointed assistant chief engineer of the system, with the same headquarters. Mr. Akers is first vice-president and president-elect of the American Railway Engineering Association.

Carl E. Gipe, whose promotion to division engineer of the Pennsylvania at Erie, Pa., was reported in the January issue, was born in Columbia City, Ind., on December 3, 1905, and was graduated in civil engineering from Purdue university in 1928. He entered railway service on May 1, 1929, as an assistant in the engineering corps of the Pennsylvania at Logansport, Ind., later being transferred to Chicago. In November, 1931, he was appointed an inspector at Baltimore, Md., and in June, 1934, he was appointed assistant supervisor of track at Olean, N.Y., later being transferred to Canton, Ohio. Mr. Gipe was advanced to supervisor of track at Kane, Pa., in January, 1937, and later served in that capacity at Warren, Pa., Aspinwall, Pa., and New York. In November, 1944, he was advanced to assistant division engineer at Ft. Wayne, Ind., which position he held until his recent promotion.

H. M. Goehring, whose promotion to assistant chief engineer of the Great Northern, with headquarters at Seattle, Wash., was reported in the January issue, was born in Butler county, Pa., on June 30,

H. M. Goehring

1887, and received his higher education at Bucknell University. He entered railroad service in 1913 on the construction of terminals at Winnipeg, Man. From 1914 to 1916 he served in the division engineer's office of the Great Northern at Hibbing, Minn., and in 1917 he was promoted to assistant engineer, water service, at St. Paul, Minn. In 1939 Mr. Goehring was advanced to office engineer, with the same headquarters, the position he held at the time of his recent promotion.

P. P. Wagner, whose promotion to assistant chief engineer of the Missouri Pacific, with headquarters at St. Louis, Mo., was reported in the January issue,

P. P. Wagner

was born at Concordia, Kan., on December 6, 1894, and was graduated from the University of Kansas in 1918. He entered railroad service on June 18, 1917, as a rodman on the Memphis division of the Missouri Pacific, at Wynne, Ark., subsequently holding various minor positions until 1925, when he became assistant engineer, in which capacity he served until January 1, 1938, when he was promoted to division engineer, with headquarters at St. Louis. On April 16, 1943, Mr. Wagner was further advanced to engineering assistant to the chief executive, also at St. Louis, the position he held at the time of his recent promotion.

Frederick W. Biltz, formerly engineer maintenance of way of the Reading, and who now returns from military service where he commanded the 712th Railway Operating Battalion and achieved the rank of Colonel, has been appointed assistant chief engineer of the Reading, at Reading, Pa. Mr. Biltz was born on August 15, 1892, at Ashland, Pa., and was graduated from Lafayette College in 1907, with the degree of Civil Engineer. He entered railway service in that year as a levelman on the Reading, at Philadelphia, Pa., advancing to assistant supervisor of track in that same year. During World War I he served overseas as a commissioned officer in the railway corps of the

1917

Frederick W. Biltz

A.E.F., returning to the Reading in 1919, as assistant supervisor of track at Tamaqua, Pa. In 1922 he was promoted to supervisor of track at Olney, Pa., and in 1934 he was advanced to assistant division engineer, at Reading. Two years later he was promoted to assistant to the general superintendent, and in 1941 Mr. Biltz was advanced to engineer maintenance of way, holding this position until 1943, when he entered the armed forces.

H. W. Flemming, engineer maintenance of way of the Central region of the Canadian National, at Toronto, Ont., has been promoted to chief engineer of the Grand Trunk Western, a subsidiary of the Canadian National, at Detroit, Mich., succeeding **F. P. Sisson,** whose appointment as engineering assistant to the general manager is reported elsewhere in this issue. Mr. Flemming was born at Liverpool, N.S., on January 22, 1886, and was graduated from Dalhousie University, Halifax, N.S., in 1909, with the degree of Bachelor of Engineering. He entered railway service in the latter year as a rodman on the Canadian Northern (now Canadian National) on construction between Toronto, Ont., and Ottawa, and the following year was promoted to resident engineer on construction of the line to James Bay. He was transferred to Toronto-Ottawa

construction in 1912, and later to construction between Montreal, Que., and Hawkesbury, Ont. He was advanced to inspecting engineer maintenance of the Central region, at Toronto, in 1921, and to division engineer at Hornepayne, Ont., in 1924, transferring to Montreal in 1928. In 1944 he was promoted to district engineer, at North Bay, Ont., and later that year he went to Toronto in the same capacity. In 1945, Mr. Flemming was promoted to engineer maintenance of way, at Toronto, the position he held at the time of his recent appointment.

R. R. Manion, whose appointment as engineer maintenance of way of the Great Northern, at St. Paul, Minn., was reported in the January issue, was born at Phillipsburg, Kan., on May 30, 1911, and was graduated from the University of Illinois in 1934, with the degree of B. Sc. in Railway Civil Engineering. He entered railway service as an assistant on the engineering corps of the Pennsylvania at Philadelphia, Pa., on June 15, 1934, subsequently being transferred to Clayton, Del., and Baltimore, Md. In January,

R. R. Manion

1935, he was advanced to assistant supervisor of track at Harrington, Del., being transferred successively to Dennison, Ohio, Philadelphia and Johnstown, Pa. He went with the Great Northern in September, 1938, as office asistant to the vice-president in charge of operations, at St. Paul, Minn., and in May, 1940, he was advanced to trainmaster-division engineer at Klamath Falls, Ore. Mr. Manion was appointed terminal trainmaster in January, 1942, holding that position until November of that year, when he entered the Military Railway Service, remaining in the Army until January 1, of this year.

William S. Broome, whose promotion to assistant chief engineer of the Colorado & Southern, Ft. Worth & Denver City, and Wichita Valley, with headquarters at Denver, Colo., was reported in the February issue, was born at St. Jo, Tex., on August 26, 1893, and was graduated from the Texas A. & M. College in 1914, with the degree of B. Sc. in Civil Engineering. He entered railway service in June, 1914, as a rodman on the Houston & Texas Central (now part of the Southern Pacific Lines in Texas and Louisiana) at Ennis, Tex., later serving as a transitman at Houston, Tex. In November, 1915, he went with the Atchison, Topeka & Santa Fe as a draftsman in the valuation department at Amarillo, Tex., and from September, 1916, to January, 1918, he served as a field draftsman and transitman at various points in Texas, Oklahoma, New Mexico and Missouri. On the latter date, Mr. Broome went with the Forest Products Laboratory at Madison, Wis., as an

William S. Broome

assistant engineer. In December, 1918, he became assistant engineer on the Ft. W. & D. C., at Ft. Worth, Tex., later serving as division engineer at Childress, Tex., office engineer at Ft. Worth, and location and division engineer at Plainview, Tex. In November, 1928, Mr. Broome was appointed engineer of the Trinity & Brazos Valley (now the Burlington-Rock Island), with headquarters at Houston, and continued as engineer of the Burlington-Rock Island until January, 1942, when he was advanced to engineer maintenance of way of the C. & S., Ft. W. & D. C., and W. V., with headquarters at Denver, the position he held at the time of his recent promotion.

L. A. Gillett, regional director, Federal Works Agency, New York, has been appointed assistant chief engineer of the Virginian, succeeding **A. H. Chapman,**

L. A. Gillett

who has retired. Mr. Gillett was born at Newburyport, Mass., on March 1, 1897, and was graduated from the Massachusetts Institute of Technology in 1918. After a short period of military service he entered the employ of the Virginian in December of that year, as a rodman at Princeton, W. Va. From July, 1919, until July, 1923, he was employed by various government and consulting engineering organizations, going with the Florida East Coast in the latter year as structural engineer, at St. Augustine, Fla. In February, 1928, he became structural engineer of the Cincinnati Union Terminal, at Cincinnati, Ohio. In October, 1933, he went with the Federal Works Agency at Cincinnati, later serving at Chicago and New York.

Harold D. Van Vranken, whose appointment as chief engineer of the Jacksonville (Fla.) Terminal Company was reported in the November issue, was born at Schenectady, N.Y., on December 15, 1897, and attended Norwich University (Northfield, Vt.), Tri-State College of Engineering, Angola, Ind. (B.Sc. in C.E. 1921), and also took a business course and a course in real state valuation at later dates. Mr. Van Vranken entered railway service in June, 1922, on the Fort Wayne division of the Pennsylvania, and in 1928 was ap-

Harold D. Van Vranken

pointed assistant supervisor of track at Upper Sandusky, Ohio. In 1930 he was promoted to supervisor of track at Petoskey, Mich., later being transferred to Toledo, Ohio. He resigned in August, 1936, to enter business for himself as a valuation expert and engineer in Florida, and in September, 1942, returned to railroad service as assistant division engineer on the Seaboard Air Line, at Jacksonville, which position he held until his recent appointment. Mr. Van Vranken is secretary-treasurer of the Florida section of the American Society of Civil Engineers and a senior member of the Florida Engineering Society.

Theodore M. von Sprecken, whose promotion to chief engineer maintenance of way and structures, Eastern Lines, of the Southern, with headquarters at Charlotte, N.C., was reported in the February issue, was born at Augusta, Ga., on August 7, 1893, and received his higher education at the University of Georgia. He entered railroad service in June, 1914, as a levelman on the Southern, later serving as transitman and masonry inspector until 1917, when he entered the armed forces. He returned to the Southern in 1919, and served in the construction and mainte-

nance departments as draftsman, designer and assistant engineer until 1928, when he became resident structural engineer at Lexington, Ky. In 1931 Mr. von Sprecken was appointed assistant engineer in the office of the chief engineer at Washington, D.C., and in 1937 he was promoted to assistant bridge and building supervisor at Birmingham, Ala. He became bridge and building supervisor at Somerset, Ky., in 1938, and in 1939 he was advanced to engineer of bridges, Western Lines, with headquarters at Cincinnati, Ohio, the position he held at the time of his recent promotion.

Edward L. Gosnell, assistant chief engineer of the Baltimore & Ohio, at Baltimore, Md., has been appointed chief engineer of the Reading, an affiliate of the B. & O., at Philadelphia, Pa., succeeding **Eugene Y. Allen,** who has retired. **Karl J. Wagoner,** chief engineer of the Lakefront Dock & Railroad Terminal (a joint subsidiary of the B. & O. and New York Central), at Toledo, Ohio, has been appointed assistant chief engineer of the B. & O., at Baltimore, succeeding Mr. Gosnell. A photograph of Mr. Wagoner

Edward L. Gosnell

and a sketch of his career were published in the November, 1945, issue. Mr. Gosnell was born at Granite, Md., on August 17, 1887, and was graduated from St. Johns College, Annapolis, Md., in 1906. He entered railway service in September, 1906, on construction work on the B. & O., serving at Cleveland, Ohio, Grafton, W. Va., and Cincinnati, Ohio. After a period out of railway service, from 1914 to 1916, he returned to the B. & O. as resident engineer at Cincinnati, advancing to assistant engineer and office engineer at that point. In 1918 he was promoted to assistant to the chief engineer, at Baltimore, and in 1930 he was further advanced to principal assistant engineer there. Mr. Gosnell was promoted to assistant chief engineer, at Baltimore, in 1941, holding this position until his recent appointment.

R. A. Morrison, division engineer of the Pere Marquette at Detroit, Mich., has been promoted to engineer maintenance of way, with the same headquarters, succeeding **C. J. Rist,** who has retired. **H. W. Kellogg,** division engineer at Saginaw, Mich., has been transferred to Detroit, where he succeeds Mr. Morrison. **C. I. Hartsell,** assistant engineer at Saginaw, has been promoted to division engineer to replace Mr. Kellogg. Mr. Morrison was born at Alpena, Mich., on January 23, 1897, and received his higher education at Michigan State College. He entered railroad service on June 25, 1923, as an engineer inspector on the Pere Mar-

R. A. Morrison

quette, at Flint, Mich. From September 26, 1924, to September 17, 1926, he was track supervisor with headquarters at Saginaw, Mich., being promoted on the latter date to assistant engineer at Grand Rapids, Mich., where he remained until April 1, 1927, when he returned to Saginaw as division engineer. On March 1, 1931, Mr. Morrison was transferred to Detroit, and served there as division engineer until the time of his recent promotion.

L. T. Nuckols, engineer maintenance of way of the Chesapeake & Ohio, at Richmond, Va., has been promoted to chief engineer there, succeeding **Crosby Miller,** who has retired, and the position of engineer maintenance of way has been abolished. **A. E. Botts,** assistant engineer maintenance of way, at Richmond, has been promoted to assistant chief en-

L. T. Nuckols

gineer, and the position of assistant engineer maintenance of way has also been discontinued. **V. B. W. Poulsen,** designing engineer, at Richmond, has been advanced to office engineer at that point, succeeding **A. C. Copland,** who has retired. Mr. Nuckols was born on December 12, 1890, near Rockville, Va., and entered railway service with the South & Western (now Clinchfield), subsequently engaging in location and construction work on the Louisville & Nashville, advancing from chainman to assistant locating engineer. Later he went with the Bureau of Valuation of the Interstate Commerce Commission for a period of 18 months. In 1916 he entered the employ of the C. & O. as resident engineer on various heavy construction projects in West Virginia, and in 1923 he was promoted to district engineer at Ashland, Ky., and in 1932 to resident engineer at Huntington, W. Va. He returned to Ashland in 1933 as assistant division engineer, rising to division engineer there in 1936. Three years later he was promoted to engineer of track, at Richmond, and in 1941 he was further advanced to assistant chief engineer. Mr. Nuckols was promoted to engineer maintenance of way at Richmond, in 1943, holding that position until his recent promotion.

A. E. Botts

Mr. Botts was born at Bethel, Ky., on July 15, 1882, and received his higher education at Kentucky University. He entered railway service in 1906 as a rodman on the C. & O., at Cincinnati, Ohio, transferring in 1907 to Ashland, Ky., where he was advanced to assistant engineer in 1908. He was promoted to assistant division engineer, at Covington, Ky., in 1910, being transferred to Ashland the following year. After two years' service as track supervisor, he was advanced to division engineer, at Huntington, W. Va., in 1914. In April, 1929, he was promoted to general supervisor of bridges and buildings, system, at Richmond, and three months later he was further advanced to assistant engineer maintenance of way, remaining in the latter position until his recent promotion.

Milton A. McChesney, whose promotion to office engineer of the Great Northern, at St. Paul, Minn., was reported in the January issue, was born at Burt, Iowa, on November 7, 1885 and received his higher education at Iowa State College, Ames, Iowa, during 1904, 1905 and 1906. He entered railway service during summer vacations as a field draftsman on location

with the Chicago, Milwaukee & St. Paul (now Chicago, Milwaukee, St. Paul & Pacific). Prior to 1913 he was engaged in engineering work in the municipal and industrial fields, and in that year he went with the Great Northern in the engineering department. Mr. McChesney was advanced to chief draftsman, with headquarters at St. Paul, in August, 1918, remaining in this position until his recent promotion.

J. W. Demcoe, division engineer Toronto Terminal division of the Canadian National, at Toronto, Ont., has been advanced to engineer maintenance of way of the Central region, with the same headquarters, and **H. O. Waddell,** assistant division engineer of the London division at London, Ont., has been promoted to division engineer of the Toronto Terminals, succeeding Mr. Demcoe.

Fred D. Danford, whose promotion to assistant to the chief engineer of the Texas & Pacific, at Dallas, Tex., was reported in the January issue, was born at New Boston, Ill., and received his civil engineering training at the University of Illinois. He entered railway service in June, 1909, with the Chicago, Burlington & Quincy, subsequently being employed in general land office survey work in Central Utah on the Oregon Short Line (now part of the Union Pacific), and later serving the Missouri Pacific, at St. Louis, Mo. In April, 1912, he went with the Texas & Pacific as a draftsman, at Dallas, which has remained his headquarters since that time. Mr. Danford was advanced to bridge inspector in 1915, and to chief draftsman in 1916. In April, 1917, he was promoted to office engineer, holding this position until his recent advancement.

L. B. Hewlett, whose promotion to assistant division engineer on the Chesapeake & Ohio, at Ashland, Ky., was reported in the January issue, was born on February 9, 1906, at Blaine, Ky., and obtained his higher education at Virginia Military Institute. He entered railway service on June 17, 1929, with the C. & O. as a recorder on a recapture survey. On February 1, 1930, he was assigned to the office of the engineer maintenance of way at Richmond, Va., as a draftsman. From May 18, 1932, to April 7, 1934, he served as a laborer on various types of gangs on the Huntington division and also qualified as a crane operator on this division. On the latter date he was appointed assistant treating inspector at the company's timber treating plant at Russell, Ky., being appointed assistant cost engineer, with headquarters at Richmond, on August 17, 1936. On January 18, 1941, Mr. Hewlett was promoted to supervisor of track of the Shelby district, with headquarters at Pikeville, Ky., which position he held until his recent promotion.

George **Baylor,** whose promotion to assistant division engineer of the Ft. Wayne division of the Pennsylvania, at Ft. Wayne, Ind., was reported in the January issue, was born in Augusta county, Virginia, on September 30, 1910, and was graduated from the Virginia Military Institute in 1933, with the degree of B.S. in Civil Engineering. He entered railway service in April, 1934, as an assistant on the engineering corps of the Pennsylvania, at New Castle, Pa., subsequently serving in the same capacity at Johnstown, Pa., and Mansfield, Ohio and Niles. On January 1, 1936, he was advanced to assistant supervisor of track at Enola, Pa., being transferred to New York in May of that year. He became supervisor of track at Crestline, Ohio, in October, 1939, and in February, 1942, he was transferred to Trenton, N.J. Mr. Baylor entered military service in April, 1942, as a captain in the 730th Railway Operating Battalion, and rising to the rank of Lt. Colonel, commanding the battalion. Col. Baylor was placed on inactive duty in October, 1945, and two months later he was appointed assistant division engineer on the Pennsylvania, at Ft. Wayne.

Track

William F. Monahan, whose retirement as general track supervisor of the Southern Pacific, at San Francisco, Cal., was reported in the January issue, was born in Scotland in 1875, and came to this country in 1889. He entered railway employment in 1892 as a sectionman on the

William F. Monahan

Galveston, Houston & San Antonio (now the Texas & New Orleans, a part of the Southern Pacific system), and in 1894 he became a track walker on the Rio Grande division of the Southern Pacific, returning to the G. H. & S. A. a few months later as a bridge and building carpenter. After serving in that capacity and later as a car repairman and as a brakeman on the G. H. & S. A., he re-entered the employ of the Southern Pacific as a sectionman on the Tucson division in 1900. Mr. Monahan was promoted to acting roadmaster in 1904, and to roadmaster the following year. In 1909 he was further advanced to general roadmaster of the Tucson division. In 1912 he was transferred to Colton, Cal., subsequently serving in Los Angeles, Cal., and other points until 1925, when he was made general track inspector, with headquarters at San Francisco, Cal. Mr. Monahan was promoted to general track supervisor in 1940, also at San Francisco.

M. Boese, section foreman on the Canadian National at Elgin, Ont., has been promoted to roadmaster at Trenton, Ont., succeeding **J. W. Risk,** promoted.

Marvin L. Horton, recently released from military service, has been appointed assistant to the general roadmaster of the Atlantic Coast Line, at Florence, S.C.

J. H. Chilvers has been appointed roadmaster on the Canadian National at Ottawa, Ont., succeeding **J. D. Sauve,** whose transfer to Lindsay, Ont., was reported in the February issue.

D. C. McLeod, roadmaster on the Canadian Pacific, at Minnedosa, Man., has been transferred to Ft. William, Ont., succeeding **L. R. Weare,** who has been transferred to Bredenbury, Sask.

M. B. Miller has been appointed assistant supervisor of track on the Pennsylvania, at Wilmington, Del., and **M. P. Patterson** has been made assistant supervisor of track, at Huntingdon, Pa.

C. E. Moore, assistant roadmaster on the Chicago, Milwaukee, St. Paul & Pacific, at St. Marys, Wash., has been promoted to roadmaster, at Othello, Wash., succeeding **W. H. Grau,** who has been assigned to other duties.

W. F. Jarl, who has been on military leave of absence, has been appointed roadmaster on the Chicago, Burlington & Quincy, at McCook, Nebr., succeeding **L. E. Baker,** who has been made supervisor of track at Oxford, Nebr.

Charles D. Binning, who has been on leave of absence to serve in the armed forces, has been appointed assistant supervisor of track on the Columbus division of the Pennsylvania, at Columbus, Ohio, succeeding **Ernest Colange,** assigned to other duties.

William T. Elmes, recently returned from military service, has been appointed roadmaster on the Pittsburgh & Lake Erie, with headquarters at Pittsburgh, Pa., succeeding **Robert E. Vandivort,** who has returned to his former position as inspecting engineer.

F. B. Cox, supervisor of track, subdivision No. 28 of the Electric division of the New York Central, with headquarters at New York, has been transferred to subdivision No. 3, Eastern division, with headquarters at Beacon, N.Y., succeeding **P. B. Garrison** who has been transferred to New York, relieving Mr. Cox.

H. H. Spruill, formerly assistant supervisor of track on the Philadelphia Terminal division of the Pennsylvania, and who now returns from military service, has been appointed assistant supervisor of track on the Middle division, at Altoona, Pa., succeeding **W. E. Price,** who returns to his former position in the office of the chief engineer, Eastern region, at Philadelphia, Pa.

S. J. Hendrix, roadmaster on the River division of the St. Louis-San Francisco, at Poplar Bluff, Mo., has been transferred to Chaffee, Mo., succeeding **H. G. Harmon,** transferred. **E. L. Brand,** roadmaster on the River division, also at Chaffee, has been transferred to Poplar Bluff, relieving Mr. Hendrix, and **Emery H. Miller** has been appointed roadmaster at Chaffee, replacing Mr. Brand.

(Continued on page 336)

Building?

GET OFF TO A GOOD START

with

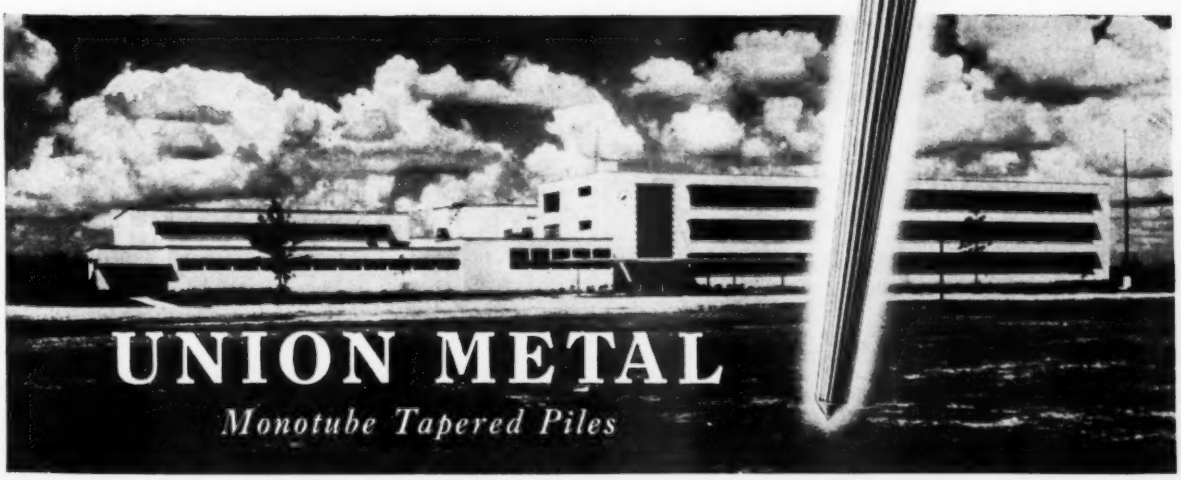
MONOTUBES...

MONOTUBE is the brand name for Union Metal's job-proven and widely-used *steel* pile . . . developed for the *fast, safe, economical* installation of cast-in-place foundations.

Their exclusive *fluted, tapered* design permits driving with average job equipment . . . thus simplifying your work, speeding your projects, cutting your costs.

A special *extendible* feature makes field extensions, with tapered or uniform sections, easy and dependable. Hollow, tubular . . . they can be thoroughly inspected, top to toe, before the concrete goes in.

Made in gauges, sizes and tapers best-suited for the soil conditions you have to cope with. For catalog and engineering aid, write The Union Metal Manufacturing Company, Canton 5, O.



UNION METAL

Monotube Tapered Piles

H. G. Whittet, Jr., has been appointed assistant supervisor of track on the Chesapeake & Ohio, at Chillicothe, Ohio, succeeding **H. B. Orr,** whose promotion to supervisor of track at Pikeville, Ky., was reported in the February issue.

W. Dunlop, roadmaster on the Canadian Pacific, at Lethbridge, Alta., has been transferred to supervision over the Taber and Turin subdivisions, with the same headquarters, replacing **S. Kirby,** who has been assigned jurisdiction over the Crowsnest division, also with headquarters at Lethbridge. Mr. Kirby succeeds **R. F. P. Bowman,** whose promotion to division engineer at Brandon, Man., was reported in the February issue.

William T. Rice, just returned from military railway service, has been appointed supervisor of track on the Richmond, Fredericksburg & Potomac, at Fredericksburg, Va., succeeding **M. L. Kuhn,** who resigned October 1, 1945, to engage in railroad work with the United Nations' Relief and Rehabilitation Administration in China. **William A. Townes,** a junior engineer in the construction department, has been promoted to assistant supervisor of track, also at Fredericksburg.

J. E. Spangler, supervisor of track of subdivision No. 27, Pennsylvania division, New York Central, with headquarters at Clearfield, Pa., has been transferred to subdivision No. 10, Syracuse division, with headquarters at Lyons, N.Y., succeeding **E. J. Graney,** whose death on January 6 was reported in the February issue. **E. M. Skelton,** assistant division engineer on the Pennsylvania division, has been appointed supervisor of track at Clearfield, replacing Mr. Spangler.

J. W. Buford, formerly supervisor of track on the Cleveland division of the Pennsylvania, and who now returns from military service, has been appointed supervisor of track on the Long Island (a subsidiary of the Pennsylvania), at Jamaica, N. Y., succeeding **T. F. Scholes,** who has been transferred to the Ft. Wayne division of the Pennsylvania, at Ft. Wayne, Ind., replacing **P. C. Smedley.** Mr. Smedley has been transferred to the Long Island, at Hicksville, N. Y., replacing **F. J. Nehrhoff,** who has been appointed inspector of maintenance of way in the office of the division engineer, at Jamaica.

Francis H. Egan, supervisor of track of subdivision No. 14 of the Buffalo division of the New York Central, at Lackawanna, N. Y., has been transferred to subdivision No. 29 of the Eastern division at Brewster, N. Y., succeeding **H. A. Frederickson,** whose promotion to assistant division engineer of the Eastern division is reported elsewhere in these columns. **G. V. Granlum,** supervisor of track of subdivision No. 30, Buffalo division, at Rochester, N. Y., has been transferred to Lackawanna, replacing Mr. Egan, and **C. Breth,** supervisor of track, subdivision No. 32, St. Lawrence division, at Malone, N. Y., has been transferred to Rochester, relieving Mr. Granlum. **C. J. Randall,** assistant supervisor of track, subdivision No. 2, Electric division, at Harmon, N. Y., has been advanced to supervisor of track at Malone, succeeding Mr. Breth, and **Charles Baulkwill,** assistant supervisor of track of subdivision No. 8, Mohawk division, at Oneida, N. Y., has been transferred to Harmon, N. Y., replacing Mr. Randall. **J. V. Marotta,** in the engineering corps of the Mohawk division, has been appointed assistant supervisor of track at Oneida, relieving Mr. Baulkwill.

Bridge and Building

W. H. Miller, general bridge and building foreman of the Belleville division of the Canadian National, has been promoted to bridge and building master of the Toronto terminals, with headquarters at Toronto, Ont., succeeding **A. H. Oakley,** who has retired on a pension.

Harold D. Kruse, whose promotion to chief carpenter on the Iowa and Dakota division of the Chicago, Milwaukee, St. Paul & Pacific, was born at Farmersburg, Iowa, on March 1, 1907. After a high school education he entered the employ of the Milwaukee as a bridge and building carpenter on the Iowa and Dakota division, on June 19, 1925. In 1928 he was advanced to pile driver engineer, and in January, 1939, he was promoted to relief foreman. Mr. Kruse was advanced to system scale inspector in January, 1944, holding this position until his recent promotion.

Special

Col. Lacey V. Murrow, just released from active military service, has been appointed assistant to vice-president, operations and maintenance department, Association of American Railroads, in charge of matters pertaining to competitive forms of transportation—water, highway and air. Among his duties will be matters relating to grade crossing elimination, formerly handled by the engineer of grade crossings of the association, and by the secretary of the Committee on Grade Crossing Elimination. Colonel Murrow succeeds Arthur Anderson, who is returning to former duties on the New York Central System.

Colonel Murrow comes to the association following a number of years experience in highway and aviation work, being Director of Highways for the State of Washington from 1932 to 1940, and intimately associated with air transportation during the war. He entered military service in 1940, and until his release from active duty, saw service in practically every theater of the war, from the Southwest Pacific Command, through the Mediterranean, European, India, Burma and China theaters, ending his service as Chief of Transportation in the China theater, and Deputy Director General of the Chinese War Transportation Board, at Chunking, China.

Stark E. Tracy, whose promotion to superintendent of work equipment of the Chicago, Burlington & Quincy, at Chicago, was reported in the February issue, was born at Ithaca, Neb., on March 30, 1901, and was educated in the public high schools of Lincoln, Neb. He entered railway service in September, 1917, as a clerk in the division offices at Lincoln. In 1923 he entered the maintenance of way department as a section laborer on the McCook division, later serving as extra-gang timekeeper and as a brakeman on that division. In May, 1924, he became a welder on the Western district, subsequently advancing to head welder. In September, 1926, Mr. Tracy was promoted to track welding supervisor at Chicago, remaining in that post until April, 1943, when he entered military service in the army, serving from December, 1943, until September, 1945, on the Bengal & Assam, at Mariani Assam, India.

Obituary

George H. Seitz, resident engineer of the Reading, at Reading, Pa., died on January 17.

G. B. Copeland, roadmaster on the Atlantic Coast Line, at Wilmington, N.C., died on January 17, after a brief illness.

R. A. Bainbridge, who retired in 1931 from his position of engineer of the Esquimalt & Nanaimo, a subsidiary of the Canadian Pacific, died recently in Victoria, B. C., at the age of 80 years.

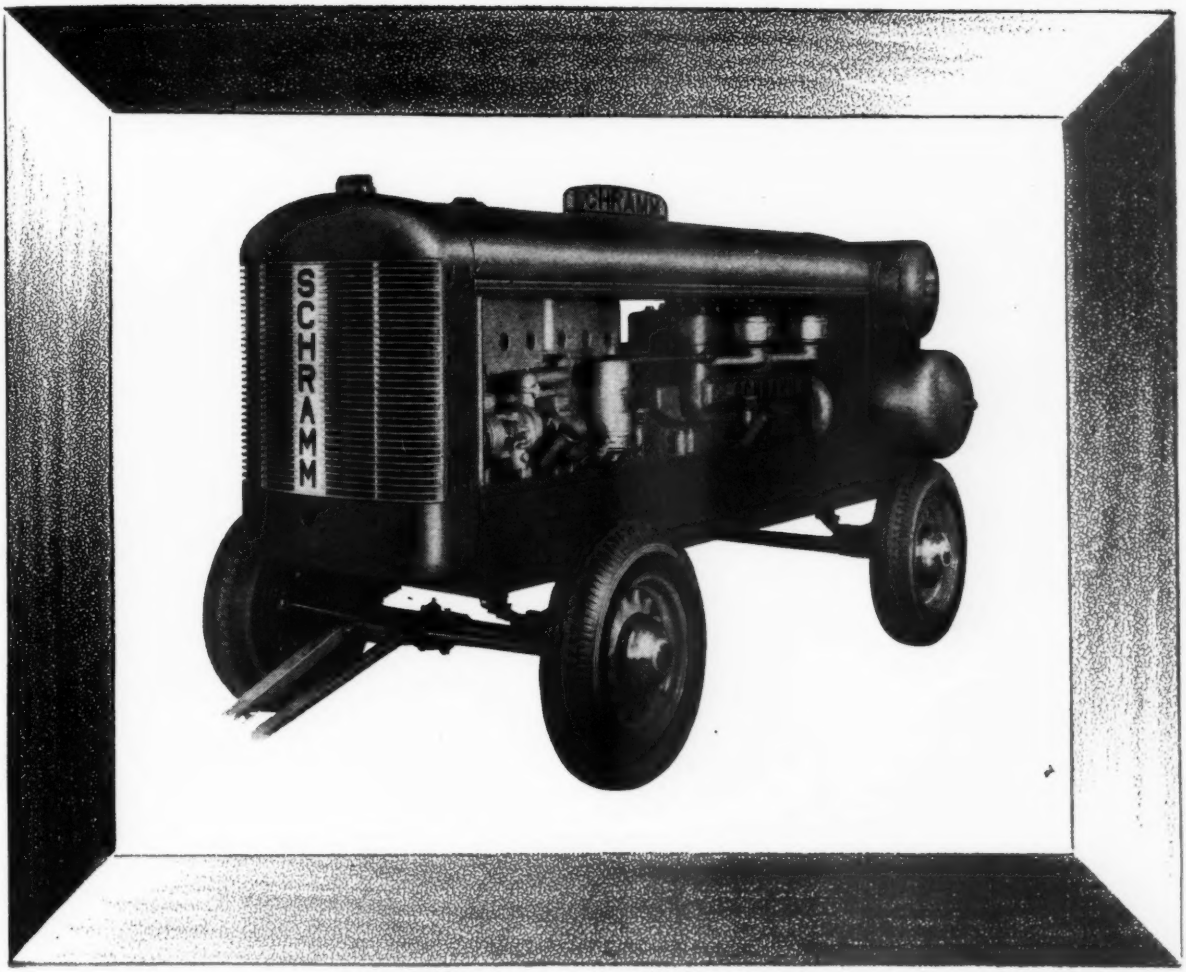
Andrew McCulloch, who retired in 1933 from his position of chief engineer of the Kettle Valley division of the Canadian Pacific (formerly the Kettle River Valley Railway), at Penticton, B. C., died there recently, at the age of 81 years.

H. E. Smith, district engineer on the Canadian National, at Montreal, Que., died on January 15, at Montreal. Mr. Smith was born at Ottawa, Ont., on May 4, 1894, and was graduated from McGill University in 1917 with the degree of B. Sc. in Civil Engineering. He entered railway service in May, 1917, as instrumentman at Ottawa, advancing to assistant engineer, Montreal Terminals in 1919. He was subsequently promoted to division engineer at Richmond, Que., later serving as assistant division engineer at Allandale, Ont., division engineer at Capreol, Ont., and assistant engineer at Toronto. On March 1, 1943, Mr. Smith was advanced to district engineer at Toronto, and the following year he was transferred to Montreal.

Shovels-Cranes-Draglines.—The Link-Belt Speeder Corporation, Chicago, has issued a 24-page attractively-illustrated booklet dealing with its Series 300 line of 1½ to 2-yd. excavating and material-handling machines.

Jordan Spreader—Ditcher—Snow Plow.—A 24-page attractively-illustrated booklet, printed in two colors, has been issued by the O. F. Jordan Company, East Chicago, Ind., which depicts the many applications in railroad service of the equipment manufactured by this company. The booklet is profusely illustrated with action photographs showing Jordan machines in use spreading rip-rap and other material, shaping ballast, ditching, moving fill, removing snow and doing other work.

(Continued on page 338)



IN AIR COMPRESSORS

THERE ARE MASTERPIECES TOO!

The superior features of Schramm Air Compressors put them in the "masterpiece" class. For that reason, behind compressed air jobs, there's usually a Schramm Compressor.

Schramm Air Compressors have these important features: (1) 100% watercooled; (2) Mechanical Intake Valve; (3) Forced Feed Lubrication; (4) Push-button electric starter.

Schramm Compressors are designed for heavy duty, continuous service, with minimum attention. And, whether they are portable or stationary, they are lightweight and compact, and vibrationless!

No wonder they give "masterpiece" performance! And no wonder you will want a Schramm as your next Air Compressor! Make your next compressed air job a "masterpiece" by using Schramm. Write today for full details and data outlined in our new catalog.

SCHRAMM INC.

THE COMPRESSOR PEOPLE
WEST CHESTER
PENNSYLVANIA

Association News

Wood Preserver's Association

The forty-second annual meeting of the association, full-scale in every respect, will be held at the Netherland Plaza Hotel, Cincinnati, Ohio, on April 23-25. A detailed program of the meeting will appear in the April issue. In the meantime, members and others interested are urged to make prompt room reservations.

Metropolitan Maintenance of Way Club

The next meeting of the club will be the annual meeting and will be held on April 25. At the February 28 dinner meeting, Colonel Frederick W. Biltz, who has recently been appointed assistant chief engineer of the Reading, presented an interesting address on "G-1 Railroading in the E.T.O.," describing the work of 712th Railway Operating Battalion, of which Col. Biltz was commanding officer, and the work of rehabilitating the U.S. Railway Lines of Communication in Europe.

B. & B. Supply Men's Association

The association has accepted an invitation of the Track Supply Association to hold a joint exhibit in the Hotel Stevens, Chicago, on September 17-19, in conjunction with the concurrent, although independent, annual meetings of the American Railway Bridge and Building Association and the Roadmasters' Association, to be held on those dates. Arrangements for the exhibit are being made by the supply associations jointly, but applications for exhibit space should be addressed to Lewis Thomas, secretary, Track Supply Association, 59 East Van Buren Street, Chicago.

Maintenance of Way Club of Chicago

The next meeting of the club will be held in the Ambassador Room of Huyler's Restaurant, Chicago, on the evening of March 25, beginning with the usual dinner at 6:30 p.m. The feature of this meeting will be an address by G. M. O'Rourke, assistant engineer maintenance of way, Illinois Central, who will discuss How the Illinois Central Has Cut Personal Injuries and Motor Car Accidents. Since the Illinois Central has given more than usual attention to this matter, which has been reflected in a marked improvement in its safety record among maintenance of way employees, it is certain that Mr. O'Rourke will present many suggestions of value to other roads in carrying out their programs.

At the last meeting of the club, on February 25, with 180 members and guests in attendance, the club was host to a large number of the Chinese Nationals who are undertaking training courses on the various roads of the United States, and was addressed by three of its guests on the scope of their studies in the United States; their observations of American railroad practices and methods; and the current railway situation in the Republic of China.

American Railway Engineering Association

As indicated elsewhere in this issue, plans have been completed for the annual meeting that is scheduled to be held at the Palmer House, Chicago, on March 12-14. With all the committees having completed their work for the year, no committee meetings were held in February.

About the middle of February, Bulletin 458 was mailed to members of the association, this bulletin containing reports of the Committees on Roadway and Ballast, Rail, and Track. This will be the last bulletin to be issued prior to the convention, with the exception of the Year Book, Bulletin 459, which will become available in time for distribution to the members before the convention.

Track Supply Association

The association is progressing its plans for a large exhibit in the Hotel Stevens, Chicago, September 17-19, in conjunction with the annual meeting of the Roadmasters' Association, and invitations to prospective exhibitors are going out. The exhibit this year will be held jointly with the B. & B. Supply Men's Association, members of which will present their exhibits in conjunction with the annual meeting of the American Railway Bridge & Building Association. Companies interested in exhibiting under the auspices of either of the supply associations should address their inquiries to Lewis Thomas, secretary, Track Supply Association, 59 E. Van Buren Street, Chicago, who is heading up the arrangements for both associations.

Bridge & Building Association

With all of the technical committees of the association at work on the preparation of their reports, looking to the annual convention of the association in Chicago on September 17-19, the association is continuing its drive for new railroad members and associate members from the railway supply industry, which, since its one-day annual meeting last October, has resulted in a total of 70 new members.

All of the plans of the association are being focused on the resumption of its annual conventions. The meeting this year will be held concurrent with, although independent of, the annual meeting of the Roadmasters' and Maintenance of Way Association, and a joint exhibit of materials and equipment by the Bridge and Building Supply Men's Association and the Track Supply Association.

Roadmaster's Association

With the view to progressing its activities and of taking up several matters of special importance, H. E. Kirby, president of the association, has called a meeting of the Executive committee in Chicago on March 11, the day preceding the opening of the annual meeting of the American Railway Engineering Association. Two matters requiring special attention are the filling, through appointment, of a vacancy in the office of second vice-president, and of a director, and the organization of a plan for promoting advertising in the 1946 Annual Proceedings of the association, to be published immediately following the convention to be held in Chicago, September 17-19.

Most of the technical committees of the association are at work on the preparation of their reports to be presented at the annual convention, but it is still not possible to present a complete list of the chairmen and vice-chairmen of these committees.

Railway Tie Association

The association will hold its Twenty-eighth annual convention in the Netherland Plaza Hotel, Cincinnati, Ohio, May 28-29.

Supply Trade News

General

The **Witte Engine Works Division** of **Oil Well Supply Company,** Kansas City, Mo., has appointed the **T-Z Railway Equipment Company,** Chicago, as its national railway sales representative to handle their line of diesel engines and diesel-electric plants.

Personal

J. C. Simmons has been appointed vice-president of **Rust-Oleum Corporation,** with headquarters in Evanston, Ill. Mr. Simmons will supervise railway sales.

George P. Torrence, president, and **John S. Clark,** vice-president, respectively, of the **Cleveland Pneumatic Tool Company,** have resigned.

H. R. Berlin has been elected a vice-president of **Johns-Manville Sales Corporation,** New York, and has been appointed manager of the building materials and general department of the company.

Fred D. Livingston, who has been on leave of absence to serve in the United States navy, has returned to his former position of sales manager of the **R. H. Sheppard Company, Inc.,** Hanover, Pa.

C. E. Murphy, W. W. Fetner, and the **Frank B. Nugent Company** have been appointed general agents, handling railway matters, of the **Rust-Oleum Corporation,** Evanston, Ill., at Cleveland, Ohio, St. Louis, Mo., and St. Paul, Minn., respectively.

J. R. Lawrence, who recently completed five years of service with the United States navy, with the rank of commander, has been appointed a representative of **Iron & Steel Products, Inc.,** in the southwest territory, at Tulsa, Okla.

Paul LaFrance, who has been serving as a lieutenant commander in the United States navy, has been appointed sales engineer for the Construction Equipment division of the **Worthington Pump & Machinery Corp.,** Harrison, N. J., with headquarters in Washington, D. C.

Peter C. Gaffney, who has returned from three years' service with the armed forces, has been re-appointed assistant secretary of the **Southern Pine Association,** at New Orleans, La. **S. P. Deas,** act-assistant manager.

(Continued on page 340)

WAR VETERAN WANTS JOB...

HANDLING — RAILS AND FROGS, SCRAP AND BALLAST

LIFTING — HEAVY MATERIALS OF ALL KINDS INCLUDING TEAM TRACK SERVICE

CLEANING — ASH PITS AND DITCHES

WORKING ON — YARD AND ROAD SERVICE, BRIDGE CONSTRUCTION, FUELING AND AUXILIARY STORAGE, STOREKEEPERS TRAIN

DOING — HEAVY ODD JOBS OF ALL KINDS

The Frisco Lines *finds plenty of work for a new Lorain 41.*

The Postwar Lorain Shovel-Crane is veritably a war veteran. In war service it was called upon to do unheard of jobs under toughest conditions.

Because of that rugged service, it is now better than ever. It's bigger, huskier, faster. It has many new improvements developed from wartime experience. It can do more work for you speedier, cheaper—goes any place, does anything, from handling ballast to widening ditches to driving piles to opening new right of way.

Before you get new equipment, find out about Lorains. There's a new Lorain "41" machine with heavier, wider, longer 2-speed chain drive crawler—new rubber-tired Moto-Cranes with greater capacity, for high-speed highway and cross-country travel (30 MPH) between your distant jobs. And there are other new models with new time-and-money-saving features. Send for complete data today. Find out how Lorains can fit into your plans—make more profits and cut costs for you on many kinds of jobs.

Reg. Trade Mark

thew-Lorain

THE THEW SHOVEL COMPANY
LORAIN, OHIO

CRANES • SHOVELS • DRAGLINES • MOTO-CRANES

TUNNEL LINER THAT FITS THE JOB!

No paying for excess weight when you use ARMCO Tunnel Liner Plates. There is a type and gage to meet every tunnel condition. This means you can order ARMCO Tunnel Liner to really *fit the job!*

These sturdy plates are relatively light in weight, yet deep corrugations and flanges insure a high strength/weight ratio. ARMCO *Heavy Duty* Liner Plates are available for tunnels where unusually heavy load conditions are encountered.

Whether it's for new tunneling or a relining job, the work goes fast with ARMCO Plates. Even inexperienced crews can install them quickly. One man easily handles the strong steel sections, bolting them together with an ordinary wrench.

Write for complete data on ARMCO Tunnel Liner for your next tunnel. Armco Drainage & Metal Products, Inc., 1345 Curtis Street, Middletown, Ohio.

EXPORT: THE ARMCO INTERNATIONAL CORPORATION

ARMCO

Armco Tunnel Liner

The **American Brake Shoe Company** has purchased **Joliette Steel, Ltd.,** producer of manganese and alloy steel castings in Canada, and will continue its operations with the same management, but under the direction of the **American Manganese Steel** division of the parent company. **Joseph B. Terbell,** executive vice-president of the Manganese division will head the company, and **J. L. Mullin,** vice-president in charge of operations of Manganese, will be a vice-president.

S. Wayne Hickey, business manager of *Railway Engineering and Maintenance* and western manager, advertising sales of **Simmons-Boardman Publishing Corporation,** at Chicago, has been elected a vice-president of Simmons-Boardman, in addition to his other duties. Mr. Hickey was born at Camden, Ark., on December 7, 1905, and received his higher education at the University of Arkansas. He entered railway service in April, 1925, as a gravel and ballast inspector on the Illinois Central, subsequently serving as chairman, rodman and valuation accountant on that road. In April, 1931, he became associated with Simmons-Boardman as a member of its circulation department, at Chicago, and in December, 1936, he was advanced to advertising sales representative. Mr. Hickey was promoted to business manager of *Railway Engineering and Maintenance* and western manager, advertising sales of Simmons-Boardman, in September, 1944.

S. Wayne Hickey

Oscar D. Nelson, general manager and treasurer of the **Butler Manufacturing Company,** Kansas City, Mo., has been elected president and general manager, succeeding **E. E. Norquist,** who becomes chairman of the board. **F. A. Ruji,** secretary, has been appointed treasurer, and **Glen C. Speakman,** general sales manager, has been elected a vice-president. **John Nelson,** vice-president, has been appointed also a special representative.

Obituary

Chauncey M. Goodrich, consulting engineer, and formerly chief engineer of the Canadian Bridge Company, died on December 10. Mr. Goodrich had been a member of the American Railway Engineering Association since 1916.

how DURA-TRED solves RAILROAD flooring problems

Many leading railroads find Dura-Tred the perfect answer to their flooring problems . . .

- It's tough
- It's durable
- It permits easy trucking

Dura-Tred restores smooth, like-new surfaces to worn, uneven floors and prevents spillage and breakage of freight.

For use indoors and out . . . Dura-Tred is especially designed to resist wear of tractor-drawn trains.

Dura-Tred offers you important savings in floor service. Write today for full details and prices.

TIME TESTED BY LEADING RAILROADS

DURA-TRED COMPANY

355 N. Central Park Blvd., Chicago 24, Ill.

SEND COUPON TODAY FOR SPECIAL INTRODUCTORY OFFER

Dura-Tred Company
355 N. Central Park Blvd.
Chicago 24, Illinois

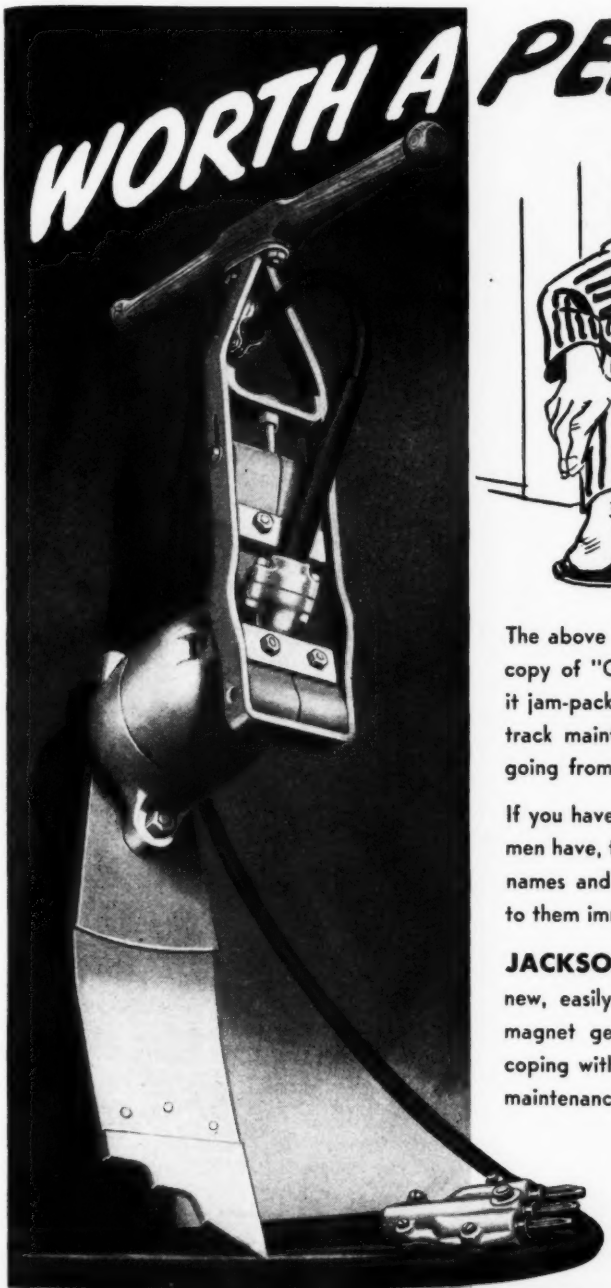
Gentlemen: Please send me information about Quick-Floor and your special introductory offer by return mail.

Name.....

Company.....

Address.....

City and Zone.....State.....



WORTH A PEEK-

AND HOW!

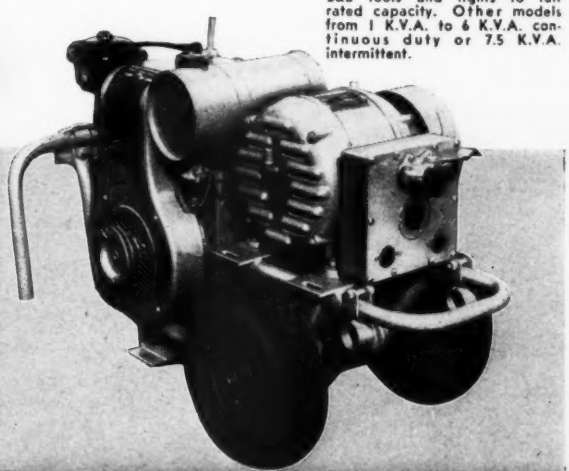
The above is the illustration on the envelope that will bring you your copy of "OBSERVATIONS ON THE JACKSON LINE." You'll find it jam-packed with solid suggestions on how to get more and better track maintenance, written in a humorous style that will keep you going from cover to cover. Sent free on request. Write now.

If you have already read it and feel as so many maintenance of way men have, that your gang foremen should also have a copy, send their names and addresses and we will see to it that copies go forward to them immediately.

JACKSON Tampers with their unique vibratory action, plus the new, easily portable JACKSON Power units with their permanent magnet generators, offer the perfect prescription for successfully coping with the particularly tough track maintenance problem ahead.

MODEL M-2

Rated capacity, 2.5 K.V.A., continuous duty, 115 Volt 3 phase or single phase 60 cycle A.C. Operates 4 JACKSON Tampers or B&B tools and lights to full rated capacity. Other models from 1 K.V.A. to 6 K.V.A. continuous duty or 7.5 K.V.A. intermittent.



JACKSON
Tampers AND
POWER UNITS

with the new permanent magnet generators which require no adjustments or maintenance, and are practically trouble proof.

ELECTRIC TAMPER & EQUIPMENT CO., Ludington, Michigan

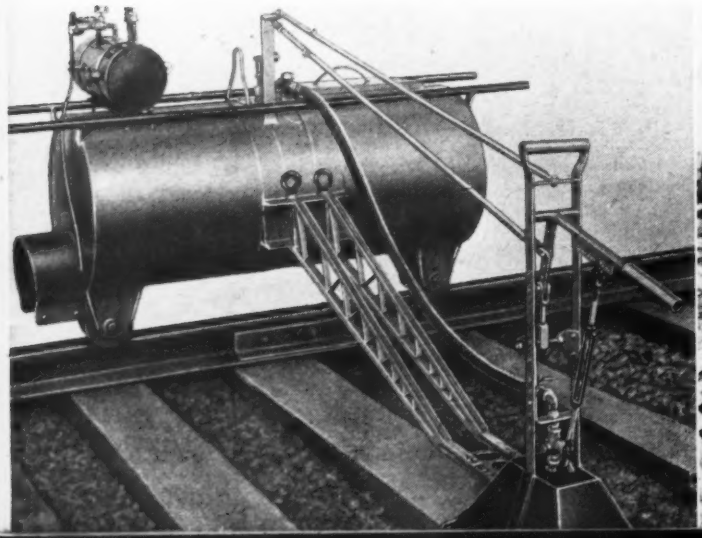
Mechanized Track Maintenance

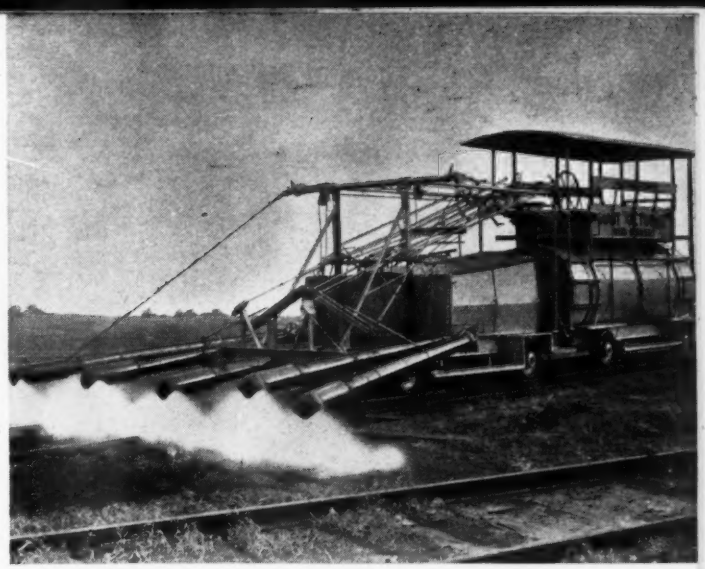
MEANS MAXIMUM EFFICIENCY and MAXIMUM ECONOMY

WOOLERY Track Maintenance Equipment is designed and constructed to assist railroads in getting roadway work done with the greatest possible speed at the lowest possible cost. More than 75 railroads throughout the world are using hundreds of WOOLERY machines efficiently and effectively to perform track maintenance tasks better, in less time and with less man-hours.

The amount of roadbed maintenance work that is required for today's high-speed trains makes mechanized track maintenance a necessity. WOOLERY is always at your service to acquaint you with the advantages of employing WOOLERY machines in your mechanized track maintenance program.

In relaying steel gangs only two men are required to apply creosote uniformly to newly adzed ties with WOOLERY CREOSOTE SPRAYERS. The WOOLERY Sprayer applies creosote faster, more safely and much less expensively. Its 60-gallon tank is equipped with a generator burner to heat the creosote, while the wind protection hood safeguards the men from skin burns and protects their clothing.





TIE replacement time, labor and cost are greatly reduced with the use of Woolery Tie Cutters. Two cuts, just inside the rail, are made in the tie with about 20 to 30 seconds required for each cut. The end sections of the tie are easily pried out with a bar, while the center section is removed by lifting out from between the rails. This results in minimum disturbance to the tie bed.

The blade of the Woolery Tie Cutter operates with a reciprocating motion and can make from 50 to 100 cuts before sharpening is necessary.

Hundreds of Woolery Tie Cutters being used by the railroads in America are helping them save up to 30% in tie renewal costs.

THE WOOLERY—offers Railroads the widest burning and most flexibly controlled Railroad Weed Burners. Flames from the "Octopus" arms are under separate, instantaneous, and positive control. They quickly destroy weeds down the sides of embankments and ditches.

THE GIANT OCTOPUS—Five Burner Type—spreads a solid sheet of flame 25 feet wide—or to 35 feet wide with arms extended. The additional spread of weed destroying fire makes the WOOLERY GIANT OCTOPUS the most valuable machine for all roadbed work.

Cost records of Railroads using WOOLERY Weed Burners prove that they provide the cheapest method of destroying weeds.

At a speed of 8 m.p.h. the 5-burner Giant Octopus burning a swath 25 feet wide consumes 37½ gallons of fuel oil per mile. At 4 cents per gallon the cost per mile is $1.50—certainly a most economical way of keeping your tracks weed-free.

WOOLERY WEED BURNERS

Available in 5-burner, 3-burner, 2-burner and 1-burner models.

WISDOM SAYS WOOLERY

EVERY WOOLERY MACHINE IS GUARANTEED

WOOLERY MACHINE COMPANY

MINNEAPOLIS — Pioneer Manufacturers of — MINNESOTA

RAILWAY MAINTENANCE EQUIPMENT

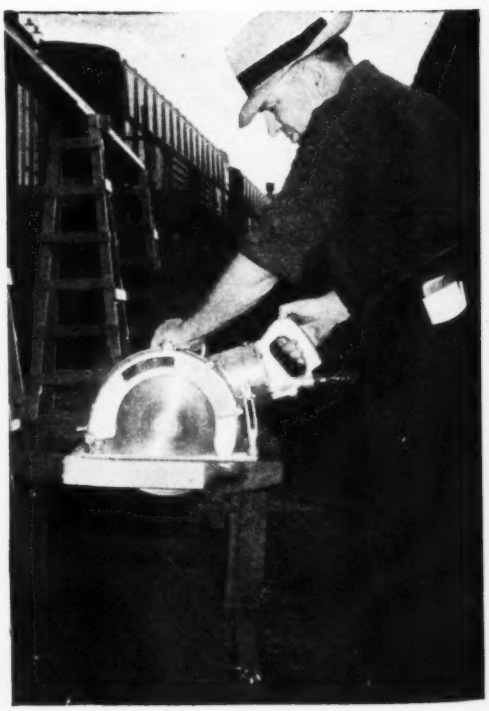
RAILWAY WEED BURNERS · MOTOR CARS · TIE CUTTERS · TIE SCORING MACHINES · RAIL JOINT OILERS · CREOSOTE SPRAYERS · BOLT TIGHTENERS

YOU NAME THE JOB—

Thor

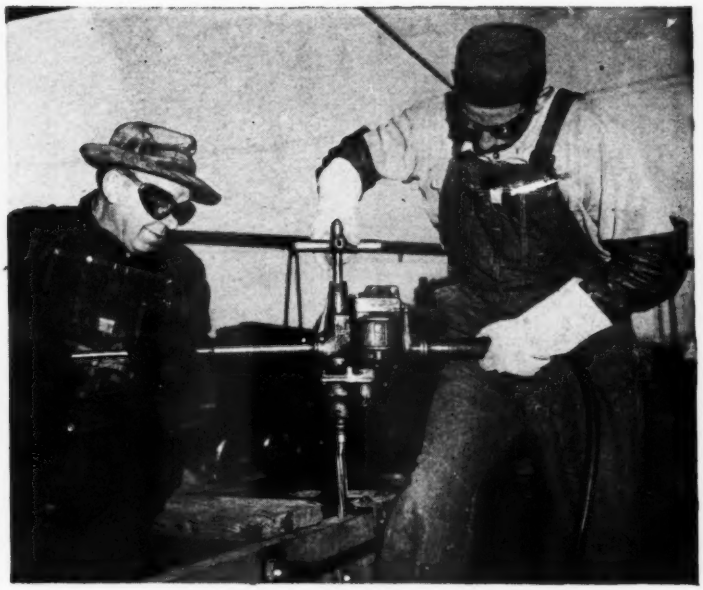
REMOVE MORE METAL faster *with powerful Thor Air Grinders. A complete range of models, carefully graduated as to capacities, weights and speeds.*

CLEAN, SHARP HOLES are made quickly and easily in toughest wood with a Thor No. 353 RHW Wood Borer, one of five models with peak-capacity ranges of 1" to 4" diameter holes.



SUPER SAW for cutting heavy timbers on bridge and building jobs is the Thor PS-12 Pneumatic Saw. With its 12-inch blade it makes straight or angle cuts to 4⅜" deep.

GETTING THE JOB DONE RIGHT and fast is assured with Thor Hammers. Light and heavy-duty tools for riveting, scaling, chipping and caulking are available in a variety of valve, handle and throttle types.



POWER TO SPARE is built into Thor heavy-duty Drills, Reamers and Tappers. A wide range of reversible and non-reversible tools in speeds and capacities for any job.

will name the air tools . . .

. . . TO DO IT FASTER, EASIER, CHEAPER!

In railway maintenance and construction, Thor Portable Pneumatic Tools make tough jobs easier. *Power-mighty . . . air-thrifty*, they are fast and smooth in operation; light and compact for easy handling. Thor valve gets more work from *all* the air to assure steady, dependable, economical performance.

In the complete Thor line you will find hammers for chipping, scaling, caulking, rivet setting and busting, staybolt and spike driving; drills, reamers and tappers; grinders and sanders; nut setters, screw drivers and wrenches; saws and wood-borers . . . all in a wide range of styles, sizes and capacities for light or heavy-duty service. For detailed specifications, ask for catalog No. 52B.

INDEPENDENT PNEUMATIC TOOL COMPANY

600 West Jackson Boulevard, Chicago 6, Illinois

Birmingham Boston Buffalo Cleveland Detroit Los Angeles Milwaukee New York Philadelphia
Pittsburgh St. Louis Salt Lake City San Francisco Toronto, Canada London, England

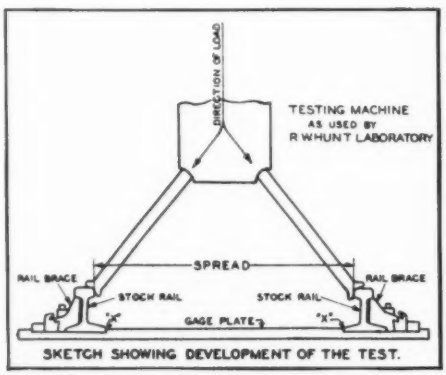
. . . Thor PORTABLE POWER TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

MORDEN

SECURITY ADJUSTABLE RAIL BRACE

—IN SERVICE ON MAJOR RAILROADS SINCE 1920—



SKETCH SHOWING DEVELOPMENT OF THE TEST.

SUPER-STRENGTH AT DANGER SPOTS

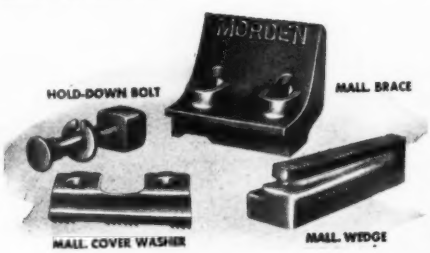
Modern high speed operation under heavy traffic throws added stresses on road beds. The Morden Security Adjustable Rail Brace provides that added security at vital spots which is so important in meeting the strain of present railway operating conditions.

The Morden Brace is especially suited for split switches and slip switches in interlocked territory where stock rails must be kept to proper gage and alinement. The simple design of the Brace makes it easy to install, adjust or remove without disturbing either the rail, tie or plate.

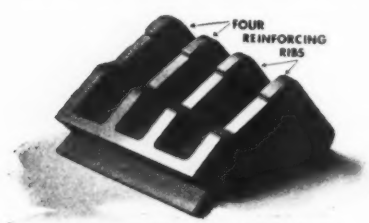
Under concentrated and comprehensive loading tests, the Morden Brace supported a weight of 50,000 lbs. at a 45 deg. angle with a spread of only ⅛ in., and with a raise in weight to 200,000 lbs., the spread was only one inch.

Pioneering in the design and production of frogs, switches, crossings, guard rails, gage rods, rail braces and security track designs, Morden has supplied the railroad industry with quality equipment for over 60 years. Our engineers are always available to help you with track maintenance problems.

COMPLETE BRACE ASSEMBLY



INDIVIDUAL BRACE PARTS



UNDERSIDE OF BRACE

Four reinforcing vertical ribs, which extend from rail web to floor of brace plate, afford the greatest possible structural strength to the design.

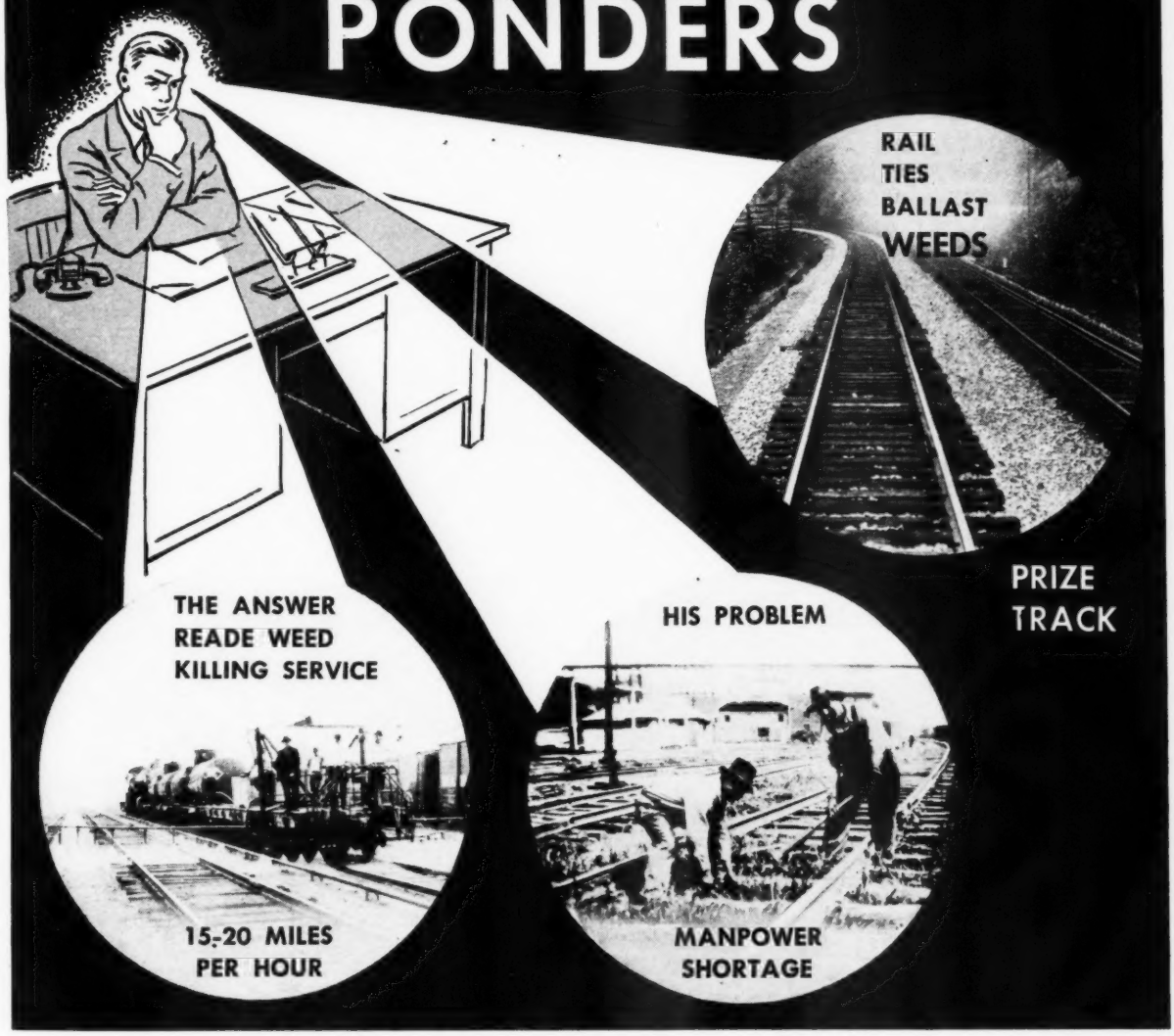
MORDEN

FROG and CROSSING WORKS

CHICAGO, ILL.

Representatives in: CLEVELAND, OHIO; NEW ORLEANS, LA.; LOUISVILLE, KY.; ST. LOUIS, MO.; WASHINGTON, D. C.

THE MAINTENANCE ENGINEER PONDERS



WHO CARES

This frame of mind among track workers cannot be tolerated.

One sure way to contribute toward this frame of mind is to neglect weed growth. Labor is scarce, hard put to keep pace with essential track maintenance work. How can a foreman cope with weed control under existing conditions?

The big systems KNOW that money invested in effective weed control work pays well, consistent yearly use of chemical retards new growth and this is just as important as killing existing growth.

The big systems also KNOW the importance of entrusting this work to a company with broad experience in this field, with the capacity to meet seasonal peak demand and with an organization that can be depended upon to take over and complete the job with the least possible loss of time.

RAILROAD KNOW HOW IS WHAT MAKES THIS POSSIBLE

This is a year of many uncertainties, one where the facilities and experience referred to may mean the difference between performance or failure in delivering on schedule.

A review of your weed control program with us may prove enlightening.

READE MANUFACTURING COMPANY

135 Hoboken Av., Jersey City, N. J. 9500 Cottage Grove Ave., Chicago, Ill.

SURPLUS PAINT SALE

EXTERIOR

OIL-TYPE READY-MIXED PAINT T-1215*

This is a medium grade paint which is ready to use and inexpensive. It produces a flat finish when brushed or sprayed on the surfaces to be protected. It is suitable for the great bulk of exterior maintenance painting where very high oil-content paints are not required. T-1215 may be also used as a first coater or undercoat over previously painted surfaces. It dries in a few hours. Write, wire or phone any of the War Assets Corporation Regional Offices below or mail this coupon.

SALE PRICE

65¢

per gallon

Minimum sale 200 gals. of any one color, F.O.B. Location, subject to prior sale.

COLORS

Black
Dark Green
Loam
Olive Drab
Haze Gray
Field Drab
Earth Red
Earth Brown

In 5 gal. containers—some in 50 gal. drums

T-1215 may be mixed in with linseed-oil-white-lead or other oil paints to obtain lighter shades or higher gloss.

INTERIOR

OLEORESINOUS EMULSIFIABLE PAINT T-1279

This paint is best suited to interior use. It is an oil-in-water emulsion type paint which may be thinned for application with water or organic solvents, such as naphtha or mineral spirits. It produces a flat finish when brushed or sprayed on the surface to be protected. T-1279 contains a fungicide for mildew prevention. It may be mixed in with white or light casein paints to produce lighter shades but not with conventional oil paints. Mail the coupon below for details about this general utility paint—or write, wire or phone your nearest War Assets Corporation Regional Office.

COLORS

Light Green
Dark Green
Field Drab
Earth Yellow
Black
Earth Brown
Sand
Olive Drab
Loam
Earth Red

SALE PRICE

65¢

per gallon

Minimum sale 200 gals. of any one color, F.O.B. Location, subject to prior sale.

VETERANS OF WORLD WAR II: To help you in purchasing surplus property, a veterans' unit has been established in each War Assets Corporation Regional Office.

FREE INFORMATION

To War Assets Corporation: Please send me, without obligation, information on the following:

☐ Oil-Type Ready-Mixed Paint, T-1215; colors.....

NAME.....TEL. NO.....

FIRM.....

☐ Oleoresinous Emulsifiable Paint, T-1279; colors.....

ADDRESS.....

CITY.....STATE.....

388-1

A DISPOSAL AGENCY DESIGNATED BY THE SURPLUS PROPERTY ADMINISTRATION for Surplus Producers' and Capital Goods, Aircraft and Plants formerly handled by Reconstruction Finance Corporation . . . and for Surplus Consumer Goods formerly handled by United States Department of Commerce.

WAR ASSETS CORPORATION

(A SUBSIDIARY OF RECONSTRUCTION FINANCE CORPORATION)

RFC OFFICES (INCLUDING FORMER DEPARTMENT OF COMMERCE REGIONAL SURPLUS PROPERTY OFFICES) LOCATED AT: Atlanta • Boston • Chicago • Denver • Kansas City, Mo. • New York • Philadelphia • San Francisco • Seattle • OTHER RFC SURPLUS PROPERTY OFFICES LOCATED AT: Birmingham • Charlotte • Cleveland • Dallas • Detroit • Helena • Houston • Jacksonville • Little Rock • Los Angeles • Louisville • Minneapolis • Nashville • New Orleans • Oklahoma City • Omaha • Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • Spokane • OTHER FORMER DEPARTMENT OF COMMERCE REGIONAL SURPLUS PROPERTY OFFICES LOCATED AT: Cincinnati and Fort Worth

This is the Portable SAW that CUTS 8 x 16's *Quick!*

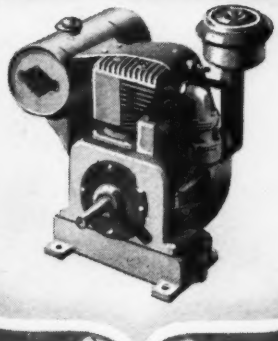
12 IN. ELECTRIC or PNEUMATIC SKILSAW!

● Either model cuts 4⅜ in. deep, rips or crosscuts 8-inch timbers in two quick cuts. Electric SKILSAW operates from power lines or portable generators on voltages up to 250 v. Pneumatic SKILSAW operates at maximum horsepower on 75 cu. ft. of free air under 80 to 100 lb. air pressure. Both SKILSAWS go right to the job, save time, labor, material handling . . . step up the output of your construction gangs. Ask your distributor today for a demonstration.

SKILSAW, INC.
5033-43 Elston Ave., Chicago 30, Ill.
Factory Branches in All Principal Cities

PORTABLE ELECTRIC
SKILTOOLS
MADE BY SKILSAW, INC.

ONLY BRIGGS & STRATTON OFFERS THIS COMPLETE WIDE-SPREAD SERVICE



ALL over the United States and Canada, and in many other countries, you will find Briggs & Stratton *Authorized Service Stations*. Operating under factory policies and procedures, they are again becoming fully equipped to take care of any emergency — to adjust, repair, or rebuild any model of Briggs & Stratton engines, even though it is a veteran of ten or twenty years of service. This authorized service is maintained to protect your investment in Briggs & Stratton engines. It is an important *added advantage*, recognized alike by manufacturers, dealers, and users of appliances, farm machinery and industrial equipment.

BRIGGS & STRATTON CORPORATION
MILWAUKEE 1, WISCONSIN, U. S. A.

Air-Cooled Power
4 CYCLE
BRIGGS & STRATTON
GASOLINE ENGINES

"DULUX" FINISHES SAY "SLOW DOWN" TO PAINT MAINTENANCE COSTS

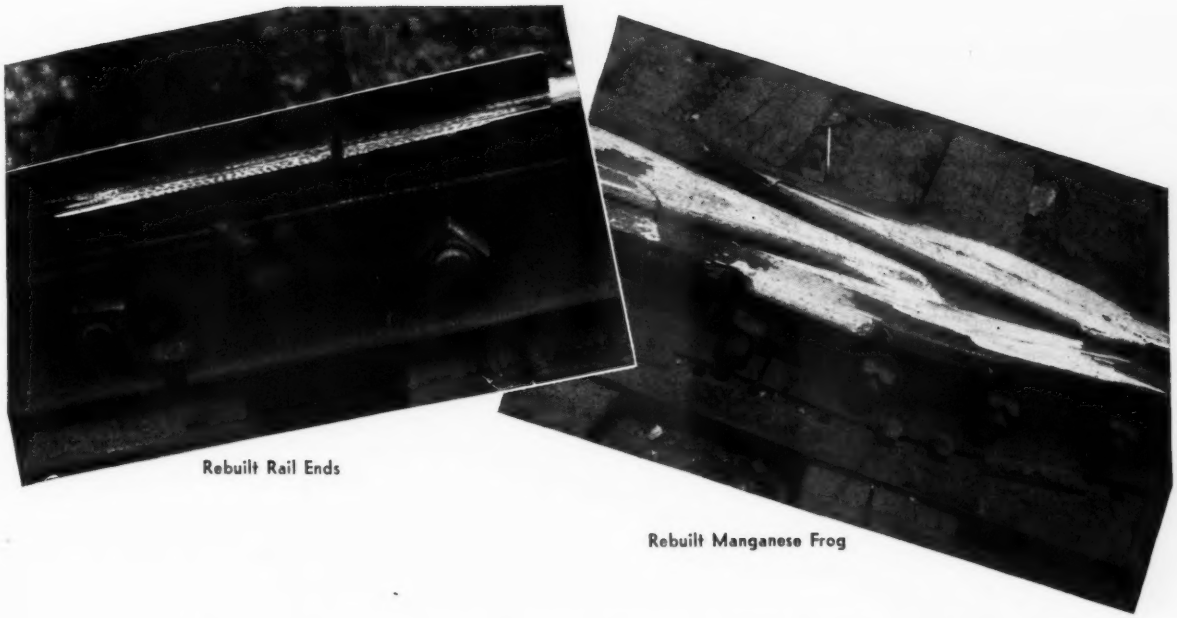
SMOKE, FUMES, DUST, DIRT. Railroad equipment takes them all—and weathering, too. It stands to reason that the finish that protects signals, switch stands, targets, bridges, towers, transformer stands and rolling stock must be resistant to the severest kind of exposure and exceptionally adhesive. That's where DU PONT DULUX comes in. Time has proved that equipment finished in DULUX can go extra months (sometimes years) without repainting; that it retains its gloss and color to an amazing degree; that DULUX spells long run economy for railroads.

E. I. du Pont de Nemours & Co. (Inc.), Finishes Div., Wilmington 98, Del.

DEPEND ON DU PONT FOR BETTER FINISHES

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY



Rebuilt Rail Ends

Rebuilt Manganese Frog

Teleweld Contract Maintenance Service is available to the Railroads in their post-war rehabilitation programs.

Teleweld Specialized Maintenance Services are backed by twenty years of experience and rigid guarantees.

Rail End Welding	Frog & Switch Welding
Rail End Hardening	Steel Bridge Reinforcement
Rail End Chamfering	Steel Tank Erection
Joint Bar Shims	Telebrineller Hardness Tester

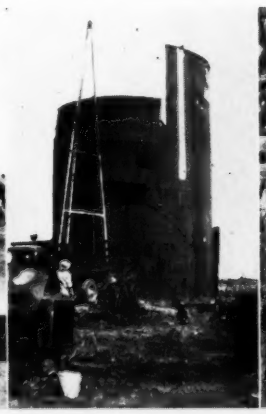
TELEWELD

Inc.

Welding Engineers & Contractors

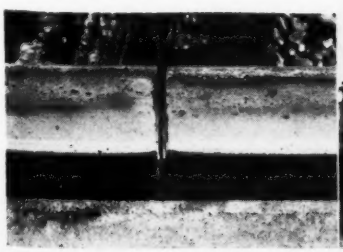
Railway Exchange Bldg., Chicago 4, Ill.

Steel Tank Erection →



← Steel Bridge Reinforcement

Chamfered Rail Ends



Joint Bar Shim

350 TON - CAPACITY - REINFORCED - CONCRETE
LOCOMOTIVE - COALING AND GRAVITY - SAND - DRYING - PLANT

COMPLETED BY US

"Shallow Pit" Roller Skip Bucket.
Automatic Electric Silent Hoist.
Very thorough automatic sand screening.

Design drawings—equipment and steelwork, and supervision of construction furnished by Ross and White Company.

All concrete materials, motor and electric parts and all labor on job furnished by Nashville, Chattanooga and St. Louis Railway.

At Atlanta, Georgia

ROSS AND WHITE COMPANY.

CHICAGO DAILY NEWS BUILDING CHICAGO

Railway & Power Engineering Corporation Limited, Toronto and Montreal, Canadian Representatives

NOW- Increase Service of Metal...Lower Upkeep Costs

BECAUSE RUST-OLEUM STOPS RUST

Rust-Oleum Rust Preventive provides effective anti-rust protection for signal bridges and other right-of-way equipment. It stops and prevents rust and corrosion caused by the damaging combination of moisture, smoke, sulphur, acids, etc. It penetrates every pore and merges the rust within the coating. The result is a tough, air-tight, rust-resistant film that will not blister, crack or peel. Rust-Oleum has cut maintenance time and costs for many American Railroads for years. Write for Catalog No. 145 "Rust-Oleum Applications."

Check These Features...

- Apply directly over any rusted surface.
- Simply wire brush to remove loose scale, heavy scale, and dirt.
- Penetrates rust—and spreads an unbroken protective film over entire surface.
- Excellent Coverage—Gallons of Economy.
- It's easy to apply—brush, dip or spray—Saves time, work and money

RUST-OLEUM CORPORATION
2417 OAKTON STREET EVANSTON, ILLINOIS

PUT UP and TAKEN DOWN...3 TIMES!

Many railway maintenance superintendents say that "portable" standard ARMCO STEELOX Buildings save them time and money. STEELOX panels can be salvaged 100 per cent—quickly moved from one location to another.

This building, for example, has been taken down and reassembled three times—and it's still ready for more moving days. Flanges are just as snug as the day they were first fitted together.

This speed and ease of erection are especially important for temporary tool houses or bunk houses along the right-of-way. Once the foundation is in, an inexperienced crew of four men can assemble a 12′ x 24′ structure in 10 hours.

Fire Resistant

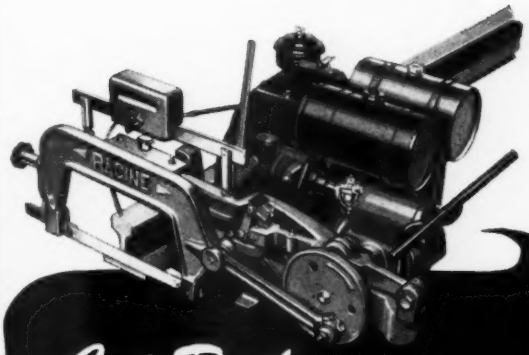
Other advantages include fire-resistant all-steel construction, and tight flanges that help prevent penetration of dust, insects, and vermin. STEELOX Buildings can be quickly wired, easily insulated.

Prefabricated sections of STEELOX are durable too. The Bonderized Galvanized PAINTGRIP surface takes and holds paint. For sizes and prices write Armco Drainage & Metal Products, Inc., 1355 Curtis St., Middletown, O.

EXPORT: THE ARMCO INTERNATIONAL CORPORATION

ARMCO

ARMCO STEELOX BUILDINGS



Cut Rail . . .

RIGHT ON THE TRACK

with . . .

RACINE PORTABLE Rail Saws

Your track maintenance and repairs can be speeded up with Racine Portable Rail Cutting Machines. This equipment cuts rail ends right on the track. No extra handling or hauling of the rail to central cropping plant.

Only one man needed to operate the Racine Rail Saw. Two men can easily carry it from rail to rail. These fast, accurate machines produce smooth, clean cuts without the overheating of rail ends that so often starts fractures leading to rail failure. Model 15 for rails to 7⅜″ high; Model 16 for rails to 10″ high.

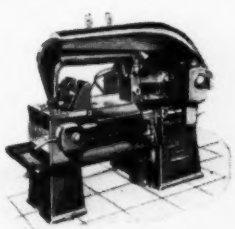
SIX COMMON JOBS FOR THIS MACHINE

1. Cutting and fitting rails at interlocking plants, crossings and switches.
2. Closing track in rail-laying operations.
3. Smooth, accurately cut rail for insulated joints.
4. Proper staggering of joints in curves.
5. Removing split, worn and battered rail ends.
6. Cutting out sections of wheel burned rails and fissures.

Models are available with gas engines, compressed air or electric motors. Write for complete catalog No. 58A. Address RACINE TOOL AND MACHINE CO., 1738 State St., Racine, Wisconsin.

RACINE HEAVY DUTY METAL SAWS FOR RAILROAD SHOPS

Cut axle shafts, boiler pipe, channels, angles and beams quickly and accurately. Models are available in all price ranges for either high speed production metal cutting or general all around shop work. Capacities 6″ x 6″ to 20″ x 20″. Ask for general catalog No. 12 giving description of complete Racine Saw line.



STANDARD FOR QUALITY AND PRECISION · RACINE TOOL and MACHINE CO. ·

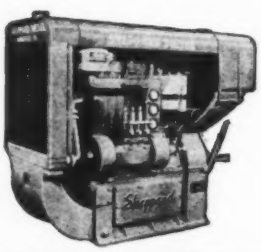
RACINE

WHERE LIGHTS BURN AND WHEELS TURN...

DIESEL'S the Power... Sheppard's the Diesel!

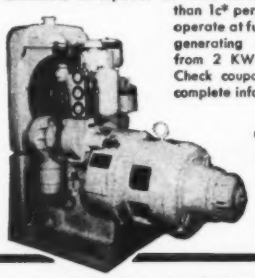
When power costs become an important item of operating expense, it's time to investigate the economy of a Diesel engine.

Sheppard Diesels have *proved* their economy of operation by reducing power costs in hundreds of installations... *frequently as much as 65%!* If *your* answer to the rising cost of labor and materials is the reduction of power bills—remember, *Diesel's the power . . . Sheppard's the Diesel!*



Model 6A-1 3-cylinder Sheppard Diesel power unit develops 25 continuous horsepower at 1200 R.P.M. Delivered complete ... ready to run... including power take-off and clutch. Costs about 96c* to operate at full load for an 8-hour day. Other models ranging from 3¾ H.P. to 56 H.P. The coupon below will bring complete information on the power unit suited to your requirements.

Sheppard 5 KW generating set is powered by a Model 7 1-cylinder Sheppard Diesel developing 8 continuous horsepower at 1200 R.P.M. Costs less than 1c* per KW hour to operate at full load. Other generating sets ranging from 2 KW to 36 KW. Check coupon below for complete information.



*Using 8c per gal. fuel oil

R. H. SHEPPARD COMPANY, INC.
36 MIDDLE ST., HANOVER, PA.

Forward complete information on Sheppard Diesel —Power Units —Generating Sets.

*Name*_____

*Address*_____

_____

*Power Unit H.P.*____ *Generator Capacity*____

WARWOOD WORKMANSHIP MAKES THE DIFFERENCE

WARWOOD TRACK TOOLS

Spike Maul No. 3-T

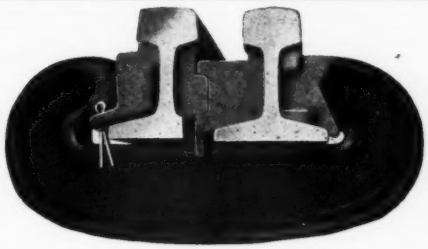
For track construction and general maintenance of way work the Warwood Spike Maul is correctly designed. Accurately forged and scientifically heat treated to meet AREA specifications and to withstand severe service. Press forged to develop fine granular structure of steel and to prevent crystallization, Warwood is the name to remember when buying Spike Mauls. Made in both Warwood Standard and Warwood Alloy grades.

PICKS... MAULS... WRENCHES
BARS... TONGS... SLEDGES
ADZES... PUNCHES... CHISELS

WARWOOD SINCE 1854 FORGED TOOLS

WARWOOD TOOL COMPANY
WHEELING, WEST VIRGINIA

Track Appliances for SAFETY AND ECONOMY



SPECIFY

Q&C UNIVERSAL TYPE GUARD RAIL CLAMPS

One size of yoke is suitable for a range of rail sections, which simplifies and reduces your storeroom stocks.

The drop forged yoke of heat treated, open hearth steel is designed of "I" beam construction for added strength and holding power under heaviest service.

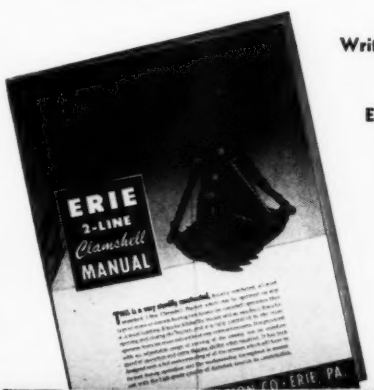
OTHER Q&C PRODUCTS: Switch Point Guards—One Piece Manganese Guard Rails—Wheel Stops—Derails—Gauge Rods—Compromise Joints—Car Replacers—Snow Flangers and Plows—Skid Shoes—Anti-Slip Rail Tongs—Flangeway Brackets—Foot and Heel Guards—Electric Snow Melters—Gauging Tools.

THE Q AND C COMPANY

Chicago, 5 **New York, 6** **St. Louis, 1**

Get the Facts From This ERIE BUCKET MANUAL

It shows how this Erie 2 line clamshell is built—how to reeve it—lubricate it . . . Shows every part. Investigate the Erie's speed and power . . . a natural for your maintenance department . . . a thoroughly standardized multi-power clamshell bucket.



Write for Bulletin 1552

1163 Geist Rd.
Erie, Pennsylvania

ERIE STEEL CONSTRUCTION CO.

ERIE, PENNSYLVANIA

Aggre Meters • Buckets • Concrete Plants • Traveling Cranes

Death to Weeds on rights-of-way...

NON-POISONOUS

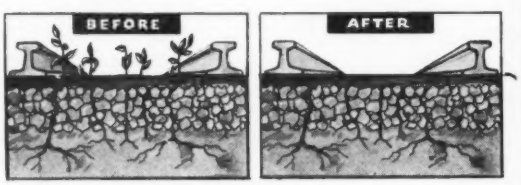
Sterling

ROCK SALT

PREVENTING weed growths on rights-of-way . . . instead of attacking them after they gain strong foothold . . . keeps tracks seasonally free of rank, quick-thriving vegetation.

Applied to weeds at their earliest stage, Sterling Rock Salt speedily nips the tender roots. It kills growths at their source. It prevents fresh offshoots from taking hold. Fire hazards from dead vegetation are eliminated . . . drainage disruptions ended.

Sterling Rock Salt should be applied in early spring. When mixed with rainwater, it filters into roadbeds as brine . . . thus hastening its efficient toxic action. But strong as its action is, this agent is *non*-poisonous . . . safe for straying livestock.



Initial treatment requires only 2 to 3 lbs. of salt per sq. yd. . . . yearly maintenance thereafter drops to 1 to 2 lbs. per sq. yd. to prevent recurrence. For complete details, methods of distribution, etc. . . . write requesting an International field engineer to call.

EXTRA! Free Bulletin Gives Whole Story!

Here are the *facts* on quick, thorough elimination of weed growths on rights-of-way. Read how tests by major U.S. railroads have proved the swift efficiency of Sterling Rock Salt. Complete with illustrations and diagrams, a copy is yours upon request. Just fill out coupon below and send in.

International Salt Company, Inc.
Dept. REM3, Scranton, Pa.

Please send a copy of your booklet on Weed Elimination for Railroads

*Name*_____

*Company*_____

*Street*_____

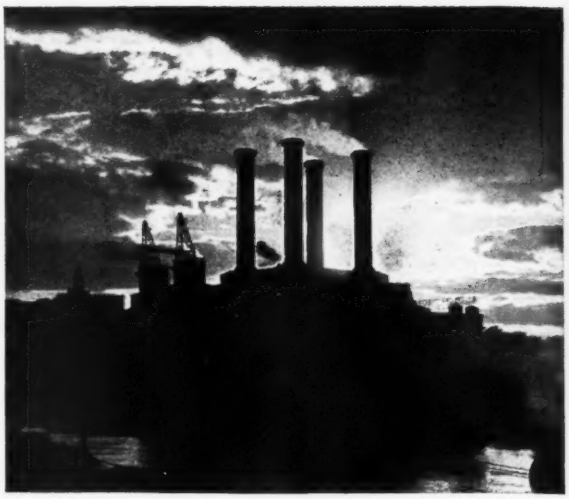
*City*_____ *State*_____

Sterling

ROCK SALT

Eliminates Weeds

INTERNATIONAL SALT COMPANY, INC., Scranton, Pa.



PROVED *and IMPROVED* For Over 65 Years...!

Layne's amazingly solid leadership in the Well Water System field is recognized the world over. As pioneers in their chosen field, they have perfected more improvements in quality and efficiency than all competitive firms combined. This has been proven time and time again. Those improvements have so distinguished Layne Well Water Systems and Layne Vertical Turbine Pumps that they are known and accepted as the standard of comparison wherever modern water producing equipment is used.

Thousands of industries, cities, mines and irrigation projects, both big and little, not only prefer but demand that their wells and pumps be built and installed by Layne. They know that Layne Well Water Systems are exceptionally fine in quality, outstanding in efficiency and always last longer.

Layne provides valuable advisory service on all kinds of well water production problems and gladly extends this cooperation without obligation. For late literature, address Layne & Bowler, Inc., General Offices, Memphis 8, Tenn.

HIGHEST EFFICIENCY

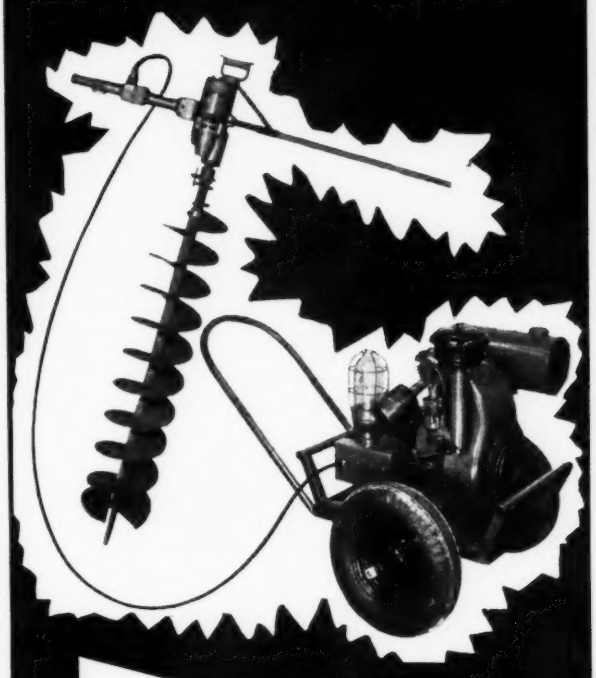
Layne Vertical Turbine Pumps are available in sizes to produce from 40 to 16,000 gallons of water per minute. High efficiency saves on power cost.

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La. ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Texas Co., Houston, Texas ★ Layne-Western Co., Kansas City, Mo. ★ Layne-Western Co. of Minnesota, Minneapolis, Minn. ★ International Water Supply Ltd., London, Ontario, Canada ★ Layne-Hispano Americana, S. A., Mexico, D. F.

LAYNE

WELL WATER SYSTEMS
VERTICAL TURBINE PUMPS

Cut Earth-Boring Costs!



KA-MO

EARTH DRILLS DIG 10 TIMES FASTER

For repair and construction work, earth testing, drilling for fences, signal installations, telephone and telegraph poles,—wherever earth boring is necessary,—the labor-saving, time-reducing, cost-cutting value of KA-MO Earth Drills can expedite your job.

These drills work in mud, sand, or clay without grabbing; bore 3" to 16" diameter holes; 3-foot extensions make it possible to drill to any required depth.

The portable electric generator is very easily carried, or can be mounted on a 2-wheel dolly.

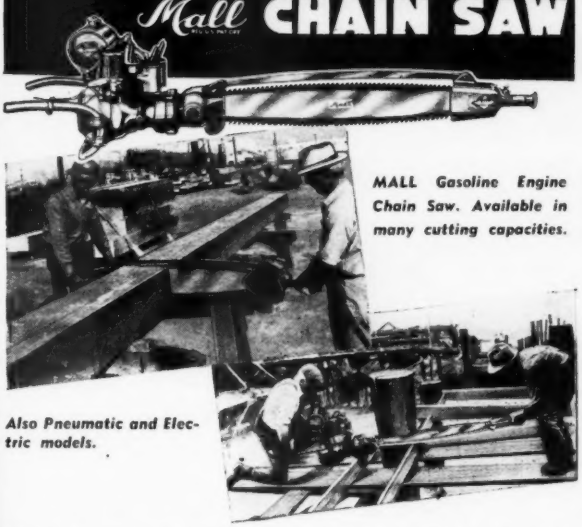
Light . . . durable . . . flexible . . . dependable . . . efficient!

An invaluable tool for the maintenance crew.

Write for CATALOGUE and full details

KA-MO TOOLS, INC.
2121 S. TROY ST., CHICAGO 23

2 MEN DO A DAYS WORK IN 30 MINUTES WITH A Mall CHAIN SAW

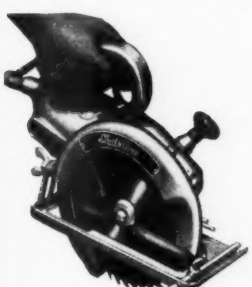


MALL Gasoline Engine Chain Saw. Available in many cutting capacities.

Also Pneumatic and Electric models.

Make the most of time and labor with a MALL Gasoline Engine Chain Saw. Cut piling, timbers and planks accurately—in a fraction of the time formerly required. Also simplify heavy construction.

Powerful 2-cycle gasoline engine starts easily—uses very little fuel. Handle throttle and stall proof clutch facilitate operation. 360 degree index permits horizontal, vertical and any angle cuts. Pneumatic models can be used to cut piling under water. Electric chain sharpeners are available.



MODEL 80

ELECTRIC Mall Saw

This powerful 8" saw has 2½" cutting capacity for cross cutting, ripping and beveling rough and dressed lumber; also cutting nonferrous metal, cutting and scoring concrete, tile and stone with an abrasive wheel. Model 128 —12" blade and 4½" cutting capacity also available.

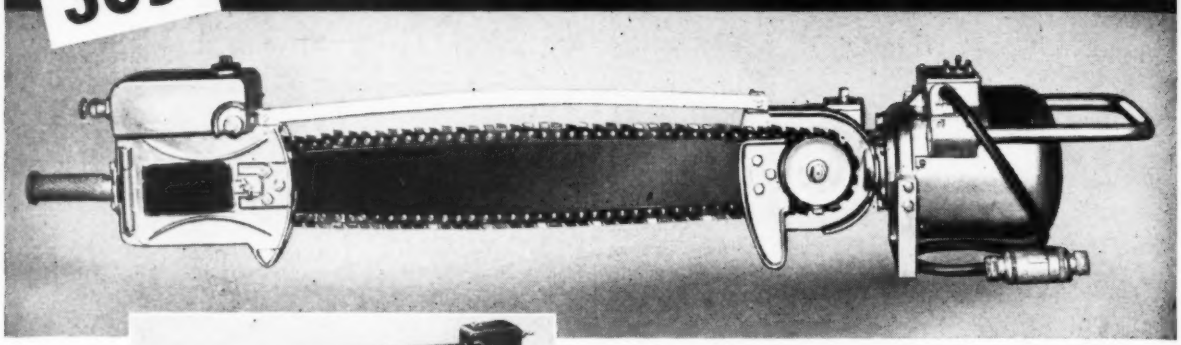
Other MALL Portable Power Tools include: Cross Slotters, Rail Grinders, Gasoline Engine, Pneumatic and Electric Concrete Vibrators and Surfacers, ¼" and ½" Electric Drills, Flexible Shaft Machines with attachments for sanding, grinding, polishing, wire brushing, buffing and drilling. Write for complete catalog to

Railroad Department
MALL TOOL COMPANY
7746 South Chicago Ave. Chicago 19, Ill.

★ 25 Years of "Better Tools For Better Work."

Mall PORTABLE POWER TOOLS

$385.00 AVAILABLE NOW Immediate Delivery!



3½ H. P. air motor, operating at 90 to 105 lbs. pressure. Available in 24" capacity — weight 50 lbs. Price $345.00 F.O.B. Worcester, Mass.

Portable two-man electric motor drive

TIMBERHOG SAW

suited for general timber cutting in construction, railroad, mine, shipyard or plant maintenance — 1½ HP Universal electric motor, 115 v. DC or 110 v. AC, 24" capacity, weight 65 lbs. Easily transported—a useful tool for construction operations. Price $385.00 F.O.B. Worcester, Mass.

TIMBERHOG
REED-PRENTICE CORP.
WORCESTER SAWS MASS., U.S.A.

"ORIGINAL and LARGEST manufacturers of portable timber saws—since 1927."

TIMBERHOG SAWS available in Air, Electric and Gasoline Engine Drive.

WORCESTER • MASSACHUSETTS

84" CULVERT PIPE

MASSEY

CONCRETE PRODUCTS COMPANY

122 S. Michigan Ave., Chicago 3, Ill.

38 Years of Service to Railroads

PIPE—PILING—BRIDGE SLABS
CRIBBING—RELAY HOUSES—SIGNAL FOUNDATIONS—BATTERY BOXES and SPECIAL PRODUCTS

SALES OFFICES: New York, 50 Church St.; Atlanta, 1607 Candler Bldg.; Minneapolis, 2429 Broadway N. E.

PLANTS: Chicago, Ill.; Birmingham, Ala.; Kansas City, Kans.; Melbourne, Ky.; New Brunswick, N. J.; Minneapolis, Minn.

Catalogues on Request

THE SAME HAMMER THAT DRIVES SPIKES—

WILL ALSO

BUST Concrete
CUT Asphalt
DRILL Rock
DIG Shale and Clay
BREAK Out Ice
BACK TAMP
and
do a host of
other jobs.

SYNTRON

GASOLINE HAMMER
Combination

SPIKE DRIVERS
and
PAVING BREAKERS

Write for Bulletin No. 8-45

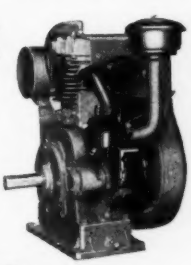
SYNTRON CO.,
290 Lexington, Homer City, Pa.

6 REASONS WHY WISCONSIN HEAVY-DUTY AIR-COOLED ENGINES ARE IDEALLY SUITED TO RAILWAY MAINTENANCE SERVICE

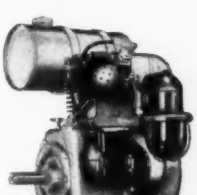
1. **AIR-COOLED.** Complete freedom from cooling chores and troubles adapts Wisconsin Engines to field service in any locality, in any climate.
2. **EASY STARTING.** All Wisconsin Air-Cooled Engines are equipped with rotary type outside magneto with impulse coupling, assuring easy starting in any weather.
3. **HEAVY-DUTY DEPENDABILITY.** Built for continuous service. Timken tapered roller bearings at both ends of crankshaft protect against bearing failure under the toughest operating conditions.
4. **LIGHT WEIGHT.** Wisconsin Engines deliver the most power per pound of engine weight, in the heavy-duty, commercial type engine field.
5. **COMPACT DESIGN.** Permits fitting Wisconsin Engines into almost any kind of a machine without interfering with basic machine design.
6. **COMPLETE POWER RANGE.** Wisconsin Engines are supplied in a complete power range from 2 to 30 hp., in single and 4-cylinder types, to meet a great diversity of service applications.

These are reasons why so many nationally known manufacturers of railroad manufacturing equipment now specify Wisconsin Air-Cooled Engines as standard power units on their machines.

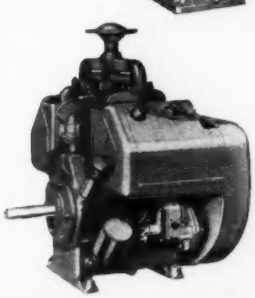
Write for descriptive literature and the name of the nearest Wisconsin Engine distributor.



Models ADH, AEH, AFH, AHH, AGH, 4-cycle single cylinder standard engine, 3 to 9 hp.



Models AB, AK 4-cycle single cylinder standard engine . . . 2 to 4 hp.



Model VE-4 V-type, 4-cycle, 4 cyl. Standard Engine.

Most H.P. per pound

WISCONSIN MOTOR Corporation
MILWAUKEE 14, WISCONSIN, U. S. A.
World's Largest Builders of Heavy-Duty Air-Cooled Engines

Detzel Restoration Service

PRESSURE GROUTING AND GUNITING OF

Disintegrated concrete and masonry structures such as piers and abutments of railroad bridges, retaining walls, power plants, dams, steel encasements, and linings for tanks, reservoirs, tunnels, canals and ditches.

GEORGE E. DETZEL COMPANY

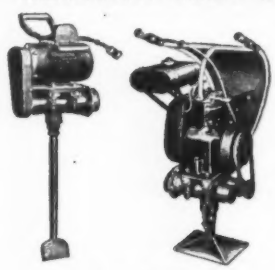
2303 Gilbert Ave. Cincinnati, O.

The bridge pictured above is located on the main line of a middle-western railroad. Disintegration (in some places 24" or more in depth) had reached a degree where repair or replacement was absolutely necessary. It was decided to use high pressure grouting and guniting, and the Detzel Company was called upon to handle the job.

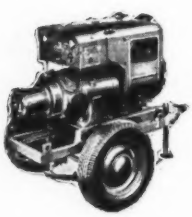
The view at the right shows the bridge after work was completed. It is conservatively estimated that fifteen to twenty years have been added to the life of the bridge. Under ordinary circumstances the structure would probably have been replaced with a new bridge, at a cost of many, many times that of the restoration job, and with a long period of slow order movements of trains.

CLIP THIS ADVERTISEMENT—CHECK CATALOGS WANTED

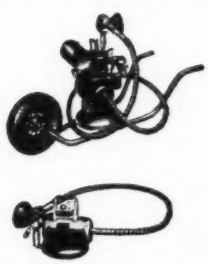
MASTER COST-SAVING EQUIPMENT—FOR IMMEDIATE DELIVERY



Electric Tie Tampers and Gas Backfill Tampers (Catalog No. 699)



Portable Gas-Electric Generator Plants. Sizes 500 to 17,000 Watts (Catalog Number 594)



Gas or Electric Grinding Machines and Power Tools (Catalog No. 683)

General Purpose Floodlights

BIG-3 for Generation, Tool Operation and Concrete Vibration (Catalog No. 687)

You can count on the Master Equipment illustrated here to solve your most difficult construction and maintenance problems. Shown are: Master Tie Tampers, Backfill Tampers, Portable Gas-Electric Generator Plants, Grinding Machines and Hand Tools—each designed to save you time and money.

Other available Master Equipment not illustrated includes: "Power Blow" Electric Hammers and Electric Pavement Breakers.

Watch for announcements of additional Master Equipment now in the making, and meanwhile let Master Equipment help you do a better job—faster and more economically.

Hand Tools for use with BIG-3 and Grinding Machines (Catalog No. 687)

CLIP THIS ADVERTISEMENT—CHECK CATALOGS WANTED

Send for illustrated catalog on any item to

MASTER VIBRATOR COMPANY

DAYTON 1, OHIO

JUSTRITE Safety-Approved Can Cuts Fire Hazards to a Minimum

Because they've proven themselves the ideal container for handling and storing flammable liquids, Justrite Gasoline Cans are standard equipment on many railroads. Justrite Gasoline Cans are sturdily constructed of heavily coated 24-gauge steel with high-gloss red enamel finish. Double seamed and soldered. Non-spill pouring lip. 7 sizes from 1 pt. to 5 gal. Convenient to fill, use and carry. Approved, inspected and individually numbered and labeled by Underwriters' Laboratories, Inc. Approved by the Associated Factory Mutual Fire Insurance Companies and so stamped.

Safety Gasoline Can

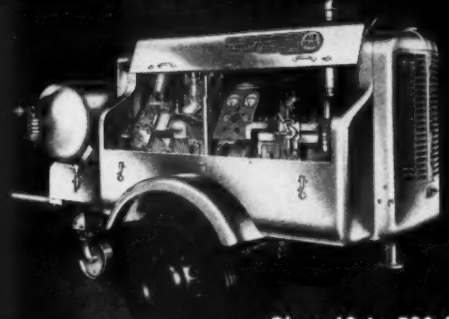
See your supplier—today!

JUSTRITE MANUFACTURING COMPANY
2063 N. Southport Ave., Dept. D-7, Chicago 14, Ill.

JUSTRITE *Safety Product*
SAFETY CANS • OILY WASTE CANS
APPROVED SAFETY ELECTRIC LANTERNS

AIR PLUS JAEGER COMPRESSOR

on thousands of jobs, Jaeger Compressors are delivering MORE air with LESS fuel



Sizes 60 to 500 ft.

Let us show you how these big-valved compressors, built like aircraft engines, are out-performing prewar type machines. Ask for Catalog JC-5.

THE JAEGER MACHINE CO. Main Office, Factory Columbus, Ohio

REGIONAL OFFICES:	8 E. 48th St. NEW YORK 17, N. Y.	226 N. LaSalle St. CHICAGO 1, ILL.	235-38 Martin Bldg. BIRMINGHAM 1, ALA.

PUMPS • MIXERS • LOADERS • HOISTS • PAVING MACHINERY

For the heaviest loads—at the busiest terminals—

Convert overloaded and inefficient turntables to three-point bearing operation at a fraction of the cost of a new table.

On new or converted tables, these powerful, well-balanced driving trucks give steady heavy-duty performance.

A truck design to suit any of your tables will be submitted on request.

R. W. YOUNG MFG. CO.
20 No. Wacker Dr.
CHICAGO 6, ILL.

MORE WORK—
MORE SAVINGS—
With Burro Cranes

Burro Cranes are easy to handle, speedy and versatile. They're designed and built for railroad work—to do it faster, better, to save locomotive and work train hours in hauling and switching—to cut to a minimum the travel time between jobs—in short, to give you more crane hours on more different kinds of jobs under widely varying conditions. Burro Cranes not only pay their way with more and more continuous work, but they save you money besides in many items of operational expense.

- Short Tail Swing
- Independent Friction Clutches
- Drawbar pull up to 7500 lbs.
- Travel speeds up to 27 m.p.h.
- Elevated Boom Heels
- Low Overall height
- Sets itself off and on track
- Can be equipped for magnet, pile-driver, air-brakes, etc.

EVERY RAILROAD NEEDS BURRO CRANES

Write for Catalogs F-115 and F-120

CULLEN-FRIESTEDT CO.

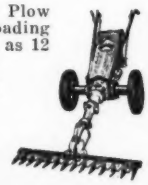
1301 So. Kilbourn Ave., Chicago 23, Illinois

ON THE JOB THE YEAR 'ROUND!

...MOWER IN SUMMER
SNOW PLOW IN WINTER

Because it solves year-round maintenance-of-way problems bigger tractors cannot, the world-famous GRAVELY, with its many exclusive features, has become a "must" item with alert engineers and maintenance men the country over.

In winter, the powerful Gravely Snow Plow clears passenger and freight platforms, loading and parking spaces, etc., of snow as deep as 12 inches. Remove only four bolts to change to 42-inch Sickle Mower (illustrated) . . . cuts tallest weeds . . . or 30-inch Rotary Mower for lawns . . . Power Brush for sweeping platforms, buildings, removing light snows. Many other attachments shown in complete catalog. Write for it.



GRAVELY MOTOR PLOW & CULT. CO.

Box 340, Dunbar, West Va.

GRAVELY
TRACTOR-MOWER

IN SERVICE SINCE 1921

Classified Advertisements

Use this section when seeking a new man, new position, or when buying or selling secondhand equipment.

CLASSIFIED ADVERTISEMENTS, $10.00 an inch, one inch deep by three inches wide, an insertion.

EMPLOYMENT ADVERTISEMENTS, 10 cents a word a month, including address, minimum charge $2.00.

Remittance must accompany each order.

Railway Engineering and Maintenance
Classified Advertising Department
105 West Adams St., Chicago 3

FOR SALE

RAILWAY MAINTENANCE EQUIPMENT

2 Adzing Machines, Nordberg Mfg. Co., New 1945
3 Motor Cars, Fairbanks Morse Co., Sheffield 40-B, New 1945
3 Push Cars, Fairbanks Morse Co., No. 35, New 1945
2 Rail Cutting Machines, Racine No. 15, New 1945
2 Track Wrenches, Nordberg Mfg. Co., with drilling attachments, New 1945
1 Track Jack, Nordberg Mfg. Co., Power Hydraulic, Used 1946
2 Spike Pullers, Nordberg Mfg. Co., New 1945
3 Spike Drivers, Chicago Pneumatic CP-117, New 1945
2 Spike Drivers, Independent Pneumatic, New 1945
4 Electric Tie Tampers, Electric Tamper & Equipment Co., "Jackson" WS4-4S, New 1945

The above equipment is in excellent condition, having been used for only a few months on one contract.

Also have for sale:

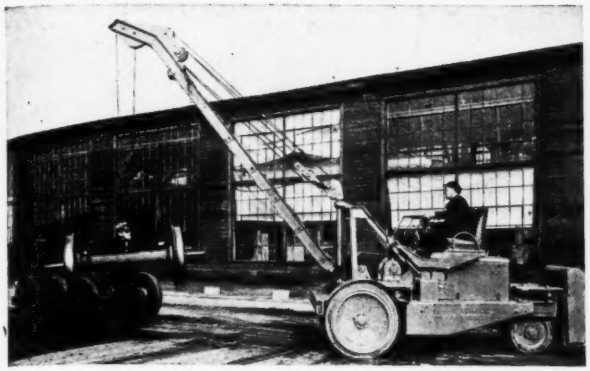
1 Locomotive, Std. Gauge, 65 Ton Steam, oil burner, built by Baldwin Locomotive Co. 1906. Completely overhauled 1945. Now in good condition.

THE KERSHAW COMPANY, INC., P. O. Box 510, Montgomery, Ala.

CULLEN-FRIESTEDT CO.

Large group experienced foreign track men with camp equipment, working on track over 20 years, looking for work. Best reference. MARIO F. MANCUSO, 251 Bowery, New York City. Phone GRamercy 7-8575

HANDLE REPAIR LOADS *Once!*



Eliminate repeated handling of the same loads! KRANE KAR picks up, transports, and positions the load. No need to maneuver the vehicle . . . operate the "live" boom from side to side and up or down, by power, with full load on the hook. Automatic load and boom braking, stability without jacks or outriggers, and other advanced features make KRANE KAR surprisingly easy to handle. Ups production in the locomotive, car, and wheel repair shops. Agents in principal cities. Write for Catalog No. 58.

USERS: AT&SF, CB&Q, BIG FOUR, B & O, PRR, CP, ETC.

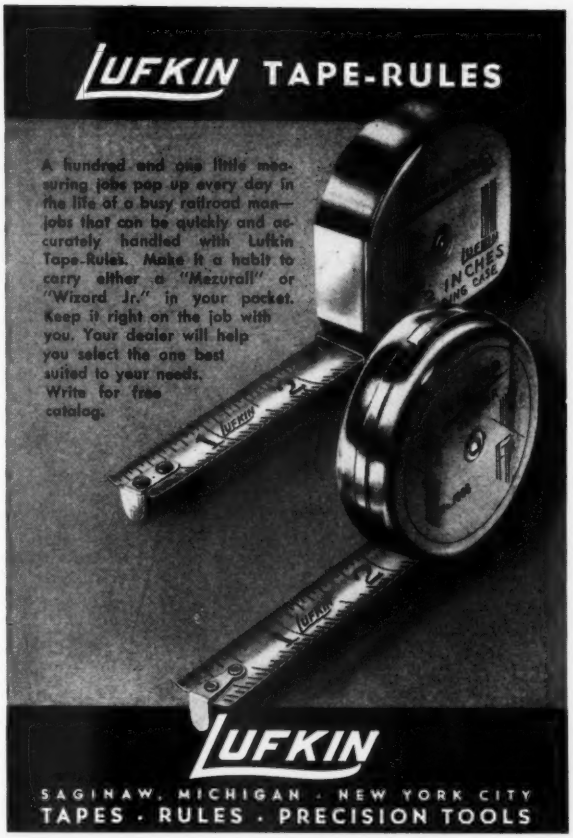
THE ORIGINAL SWING BOOM MOBILE CRANE
WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER

2½, 5, AND 10 TON CAPACITIES

KRANE KAR
TRADE MARK REGISTERED
FOR RAILROADS

SILENT HOIST & CRANE CO., 884 63rd ST., BKLYN 20, N.Y.

LUFKIN TAPE-RULES

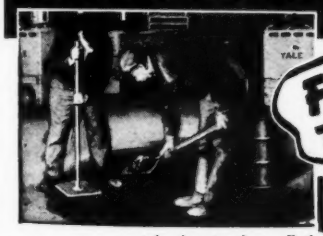


A hundred and one little measuring jobs pop up every day in the life of a busy railroad man—jobs that can be quickly and accurately handled with Lufkin Tape-Rules. Make it a habit to carry either a "Mezurall" or "Wizard Jr." in your pocket. Keep it right on the job with you. Your dealer will help you select the one best suited to your needs. Write for free catalog.

LUFKIN

SAGINAW, MICHIGAN · NEW YORK CITY
TAPES · RULES · PRECISION TOOLS

Heavy Duty Plastic Makes
SOLID FLOOR PATCH
INSTANTLY...No Wait for Setting!



FREE TRIAL OFFER

Tamp Smooth! Truck Over!

Now you can restore broken concrete to solid smoothness without having to close off the area. Use durable INSTANT-USE . . . a tough, plastic material which you simply shovel into hole—tamp—and run traffic over immediately. NO WAITING. Bonds tight to old concrete. Makes smooth, solid, heavy-duty patch. Withstands extreme loads. Keep a drum on hand for emergencies. Immediate shipment.

Request Descriptive Folder and Details of

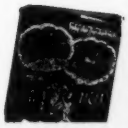
FREE TRIAL OFFER

INSTANT-USE

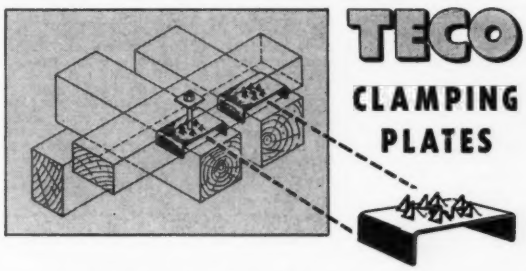
FLEXROCK COMPANY
3647 Filbert St., Philadelphia 4, Pa.

Please send me complete INSTANT-USE information and details of FREE TRIAL OFFER—no obligation.

Name .....
Company .....
Address .....



TIES TIED TIGHT *with*



TECO
CLAMPING PLATES

TECO Clamping Plate timber connectors provide the *modern* means of rigidly attaching ties to guard timbers . . . with low maintenance cost. Bolts are used in every third or fourth tie . . . with lower replacement costs.

Our latest clamping plate customer . . . the C. & O.

FREE DESIGN DATA for using CLAMPING PLATES

TIMBER ENGINEERING CO., 1319 18th St., N.W., Wash. 6, D. C.

Please mail me TECO Clamping Plate design data.

NAME.....
COMPANY.....
ADDRESS.....

RE

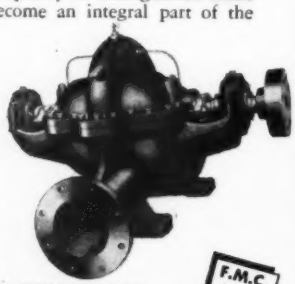
PEERLESS PUMPS

UPON THE STRONG, GREATER STRENGTH IS BESTOWED

A Statement by FOOD MACHINERY CORPORATION in regard to *Dayton-Dowd*

An important advance in the history of the pumping industry now for the first time makes available a new conception of integrated pump service to customers. *Dayton-Dowd*, long associated with sustained high quality—a distinguished name on centrifugal pumps—has become an integral part of the *Peerless Pump* organization.

This merger of broad installation-wise experience, modern technical research and alert engineering talent assures our customers for both Horizontal and Vertical types of pumps that the name "Peerless" stands as the guarantee for quality and progress.



PEERLESS HORIZONTAL PUMPS
-formerly Dayton Dowd

F.M.C. builds with STEEL

PEERLESS PUMP DIV.—FOOD MACHINERY CORP.
Factories: Los Angeles, Calif., Quincy, Ill., Canton, O.

WAR-TIME BUILDERS OF THE VICTORIOUS "WATER BUFFALO"
PEACE-TIME BUILDERS OF TOP-FLIGHT WATER PUMPS

UNIT 357

SELF-PROPELLED MOBILE CRANE

5 Ton
CAPACITY

Fast, mobile UNIT, riding on rubber! Operated by ONE man . . . Powered by ONE engine... Controlled from ONE position in cab. Rugged, compact, well-balanced. Full revolving . . . Safe. FULL VISION CAB . . . Convertible to ALL attachments.

UNIT 357
5 Ton Mobile Crane

UNIT 357
½ Yard Shovel

UNIT 357
½ Yard Clamshell

UNIT CRANE & SHOVEL CORP.
MILWAUKEE 14, WIS., U. S. A.

CONTACT FACTORY DIRECT
FOR PRICE AND DELIVERY

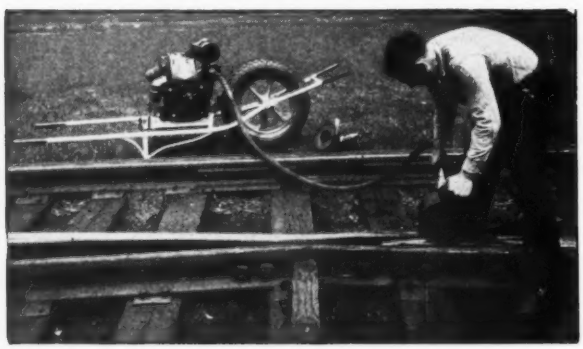
A 4910-¼

Grinds Fast . . .

Makes Rolling Stock Last

From its swivel-mounted power unit that permits operator to change working position quickly, right down to its fast-cutting wheel the RTW P-22 Portable Flexible Shaft Grinder is built for *speed*. Light, compact and portable as a wheel-barrow it is a low-cost investment in extended rail life and reduced wear and tear on rolling stock. You can use the P-22 Grinder for surfacing welded rail ends, grinding flangeways, crossings, switchpoints, stock rails; for rail end slotting—and, with attachments, for rapid drilling and cross grinding.

Write for bulletin and prices.

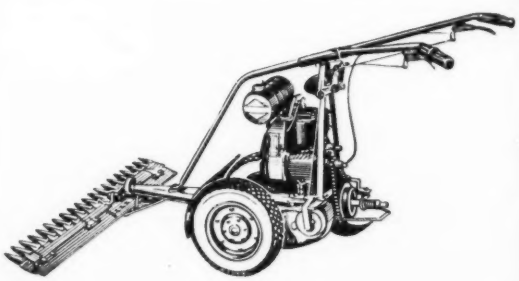


Model P-22 RTW Free-Hand Grinder—one of many models.

Railway Track-work Co.

3207 Kensington Avenue, Philadelphia 34, Pa.

251



NATIONAL SICKLE BAR MOWERS

38" Cut — Two Clutches
One for Knife — One for Traction

Over 19 railroads are using hundreds of NATIONAL Sickle Bar Mowers to keep premises weed-free economically!

Send Today for Complete Information and Details.

We are again in production. Limited deliveries are available at present.

NATIONAL MOWER CO.

839 Cromwell Ave. St. Paul, Minn.

Electricity

FOR RAILROAD WORK
Anywhere!

Models range from 350 to 35,000 watts, A. C. types from 115 to 660 volts, 50, 60, 180 cycles, single or three-phase and 400, 500 and 800 cycles, single phase. D. C. types from 6 to 4000 volts. Also available in dual voltage and special frequency types.

Onan Electric Generating Plants provide sure, on-the-spot electric power to meet many situations and applications in the Railroad Industry. Indispensable for maintenance work, signal systems, service and general lighting, repair shops, emergencies and other uses.

Driven by Onan-built, 4-cycle gasoline engines, these power plants are of single-unit, compact design and sturdy construction. They are suitable for intermittent or heavy duty, continuous service.

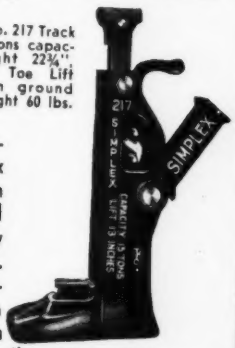
Model shown is from W2C series; 2000 to 3500 watts; powered by Onan-built, two-cylinder, water-cooled engine.

D. W. ONAN & SONS
4412 Royalston Ave.
Minneapolis 5, Minn.

Write For Folder 690-A describing complete Onan Line

A Track Jack That Defies Tough Service

Simplex No. 217 Track Jack; 15 tons capacity. Height 22¾". Lift 13", Toe Lift 2⅛" from ground level. Weight 60 lbs.



The exclusive electrided gibs of Simplex Track Jacks give them five times the normal service life of ordinary malleable iron gibs. Internal wear is further retarded by a hardened steel plate in the housing at top of gib section. Safe operation at any angle is assured by rust-proof tension spring, and by a sharp "click" which quickly tells the operator when the pawls are engaged. This jack is a brute for punishment.

SIMPLEX
WORLD'S MOST COMPLETE LINE OF
JACKS
LEVER
SCREW
HYDRAULIC

Templeton, Kenly & Co.,
Chicago (44), Ill.
Better, Safer Jacks Since 1899

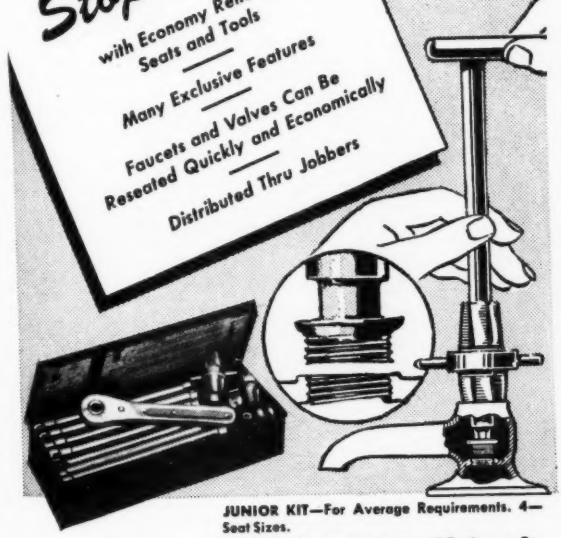
Stop Leaks

with Economy Renewable Seats and Tools

Many Exclusive Features

Faucets and Valves Can Be Reseated Quickly and Economically

Distributed Thru Jobbers



JUNIOR KIT—For Average Requirements. 4—Seat Sizes.

SENIOR KIT—For Plumbers and Engineers. 9—Seat Sizes. 9—Bushing Sizes. Reconditions Scrapped and Over Dressed Fixtures.

Write for Literature

Economy Renewable Seat Co.

2821 W. FLETCHER ST. CHICAGO 18, ILL.

STOP LEAKS
Damp Proof—Water Proof

Leaks, water seepage in concrete walls can be stopped instantly — permanently with FLEXTITE. This material will convert wet basements into bone-dry useful space. Will seal leaks against water pressure. Can be used in elevator pits, tunnels, dams, concrete water tanks, retaining walls. Efficient as a plaster coat for waterproofing and dampproofing.

Write for Further Information and Details of

FREE TRIAL OFFER

FLEXTITE

FLEXROCK COMPANY
3647-A Filbert St., Philadelphia 4, Pa.

Please send me complete FLEXTITE information . . . . details of FREE TRIAL OFFER—no obligation.

Name .....
Company .....
Address .....

I. B. LOCOMOTIVE CRANES

SAVE TIME, MONEY AND LABOR

Well engineered, ruggedly built Industrial Brownhoist Locomotive Cranes embody all of the latest, most modern developments. • All air and manual controls are within quick, easy reach of the operator, thus minimizing physical effort. • Air controls, anti-friction bearings, one piece steel bed and 360° vision from Monitor-type cab assure faster, more economical, safer operation and greater dependability under constant handling of heavy loads with magnet, hook or bucket. Write for complete particulars.

INDUSTRIAL BROWNHOIST BUILDS BETTER CRANES

INDUSTRIAL BROWNHOIST CORP. • BAY CITY, MICH. • District Offices: New York, Philadelphia, Cleveland, Chicago • Agencies: Detroit, Birmingham, Houston, Denver, Los Angeles, San Francisco, Seattle, Vancouver, B.C., Winnipeg, Canadian Brownhoist Ltd., Montreal, Quebec.

ALPHABETICAL INDEX TO ADVERTISERS, MARCH, 1946

Air Reduction Sales Co. 269
Allis-Chalmers Tractor Division 239
American Bosch Corporation 218
American Brake Shoe Company 274
American Hoist & Derrick Co. 260
Armco Drainage & Metal Products, Inc 238-340-353

Barco Manufacturing Company 252
Briggs & Stratton Corp. 349
Buda Company, The 233
Byron Jackson Co. 229

Caterpillar Tractor Co. 219
Chicago Pneumatic Tool Company 250
Chipman Chemical Company, Inc. 234
Cletrac Division of Oliver Corporation 266
Cullen-Friestedt Co. 362

Dearborn Chemical Company 211
Detzel Co., George E. 360
Dow Chemical Company, The 261
Dowell Incorporated 225
Duff-Norton Manufacturing Co., The 267
Du Pont de Nemours & Co., Inc., E. I. 350
Dura-Tred Company 340

Eaton Manufacturing Company 210
Economy Valve Seat Co. 365
Electric Tamper & Equipment Co. 341
Erie Steel Construction Co. 355

Fairbanks, Morse & Co. 235
Fairmont Railway Motors, Inc. 254-255
Flexrock Company 363-365

Food Machinery Corp. 364

General Chemical Company 268
Gisholt Machine Co. 256
Gorman-Rupp Company, The 265
Gravely Motor Plow & Cultivator Co. 362

Homelite Corporation 257
Hubbard and Company 217

Independent Pneumatic Tool Company 344-345
Industrial Brownhoist Corp. 366
Ingersoll-Rand 221
International Harvester Company 224
International Salt Company, Inc. 356

Jaeger Machine Co., The 361
Jordan Company, O. F. 249
Justrite Manufacturing Company 361

Kalamazoo Manufacturing Company 262-263
Ka-Mo Tools, Inc. 357
Kershaw Company, Inc., The 244-245

Layne & Bowler, Inc. 356
Le Roi Company 253
Le Tourneau, Inc., R. G. 226-227
Lewis Bolt & Nut Company 228
Link-Belt Speeder Corporation 247
Lufkin Rule Co., The 363

Maintenance Equipment Co. 241
Mall Tool Company 357
Massey Concrete Products Company 358
Master Builders Company, The 242
Master Vibrator Co. 360
Morden Frog and Crossing Works 346
Moss Tie Co., T. J. 246

National Lead Company 214
National Lock Washer Company, The 367
National Mower Co. 364
Nordberg Mfg. Co. 222-223
Northwest Engineering Company 215

Oliver Corporation, The 266
Onan & Sons, D. W. 365
Orton Crane & Shovel Co. 212
Oxweld Railroad Service Company, The 243

P. & M. Co., The 209
Peerless Pump Division 364
Pettibone Mulliken Corporation 251
Pittsburgh Pipe Cleaner Company 240
Portland Cement Association 220

Q and C Company, The 355

Racine Tool and Machine Co. 353
Rail Joint Company, Inc., The 216
Railroad Accessories Corporation 271
Rails Company, The 368
Railway Maintenance Corp. 259
Railway Track-work Co. 364
Ramapo Ajax Division 274
Reade Manufacturing Company 347
Reconstruction Finance Corporation 248-348
Reed-Prentice Corp. 358
Rodgers Hydraulic, Inc. 236
Ross and White Company 352
Rust-Oleum Corporation 352

Schram, Inc. 337
Sheppard Company, Inc., R. H. 354
Silent Hoist & Crane Co. 363
Simmons Boardman Publishing Corp. 264
Skilsaw, Inc. 349
Snow Construction Co., T. W. 272
Standard of California 258
Stonhard Company 349
Syntron Co. 359

Teleweld, Inc. 351
Templeton, Kenly & Co. 365
Thew Shovel Company, The 339
Timber Engineering Co. 363
Timkin Roller Bearing Company, The 231

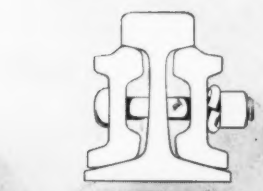
Union Carbide and Carbon Corp. 243
Union Metal Manufacturing Company, The 335
Unit Rail Anchor Company, Inc. 217
Unit Crane & Shovel Corp. 364

War Assets Corporation 248-348
Warren Tool Corporation 213
Warwood Tool Company 354
Wisconsin Motor Corporation 359
Wood Industries, Inc., Gar 230
Woodings-Verona Tool Works 232
Woolery Machine Company 342-343
Worthington Pump and Machinery Corporation 237

Young Mfg. Co., R. W. 361

Track maintenance is a terrific job under the incessant pounding of today's heavy traffic loads. Improved Hipower spring washers help do that tough job.

IMPROVED HIPOWERS IMPROVE TRACK

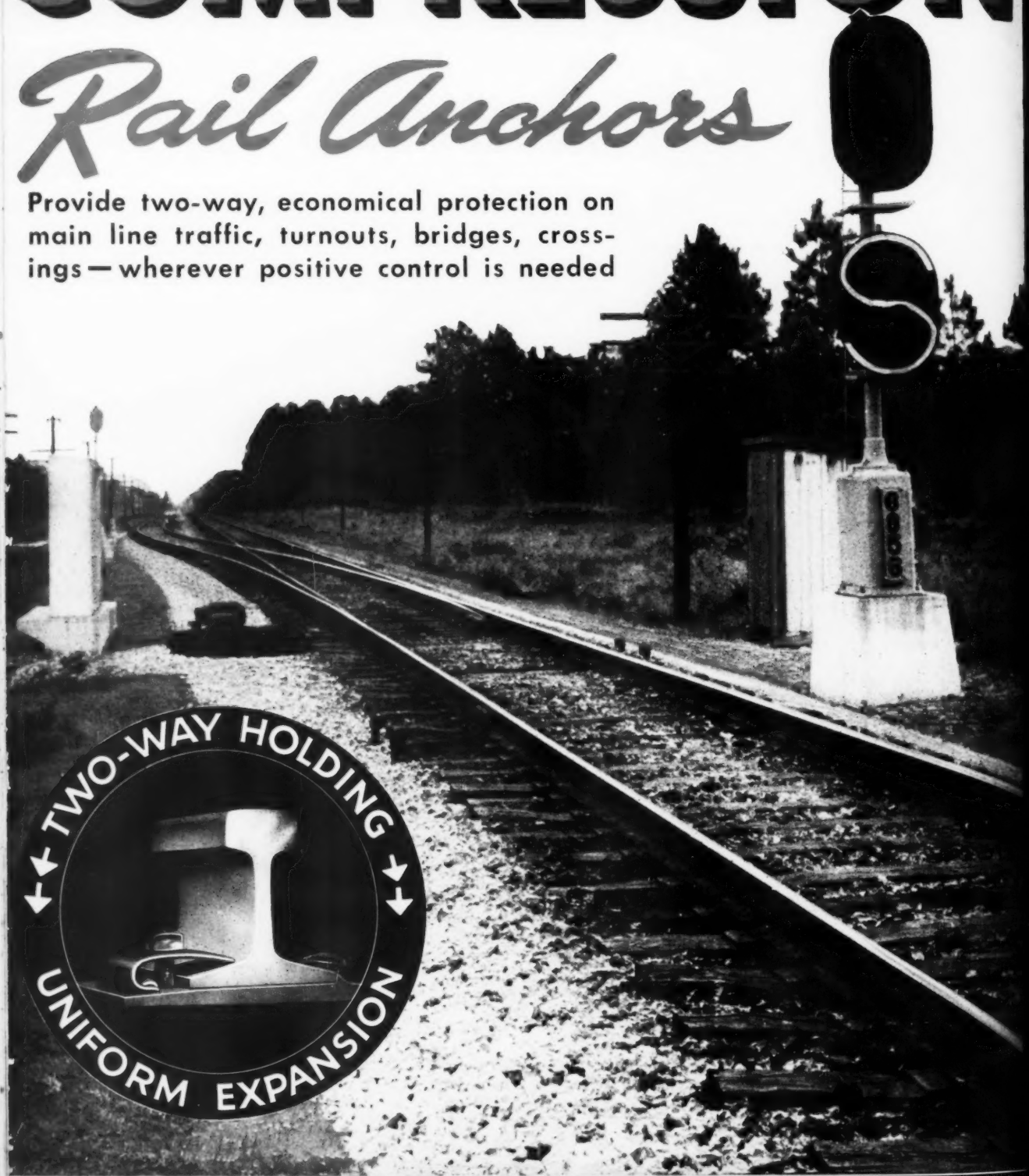


THE NATIONAL LOCK WASHER COMPANY, NEWARK, 5, N. J., U. S. A

COMPRESSION

Rail Anchors

Provide two-way, economical protection on main line traffic, turnouts, bridges, crossings — wherever positive control is needed



THE RAILS COMPANY

General Office

178 GOFFE STREET, NEW HAVEN 11, CONN.

ST. LOUIS, MO. HOBOKEN, N. J. CHICAGO, ILL.